

**CURRICULUM AND SYLLABUS (R 2015)**  
**CHOICE BASED CREDIT SYSTEM**  
**(Applicable to the batch admitted from July 2015)**

**B.TECH – CIVIL ENGINEERING**  
**(FULL TIME)**  
**I – VIII SEMESTERS**

| <b>SEMESTER I</b>                                                                                                                                                                 |                 |                                                             |                                 |          |          |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------------------------------------------|---------------------------------|----------|----------|----------|
| <b>Code No.</b>                                                                                                                                                                   | <b>Category</b> | <b>Course Title</b>                                         | <b>L</b>                        | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>THEORY</b>                                                                                                                                                                     |                 |                                                             |                                 |          |          |          |
| BEN101                                                                                                                                                                            | HS              | English – I                                                 | 3                               | 1        | 0        | 3        |
| BMA101                                                                                                                                                                            | BS              | Mathematics – I                                             | 3                               | 1        | 0        | 3        |
| BPH101                                                                                                                                                                            | BS              | Engineering Physics – I                                     | 3                               | 0        | 0        | 3        |
| BCH101                                                                                                                                                                            | BS              | Engineering Chemistry – I                                   | 3                               | 0        | 0        | 3        |
| BCS101                                                                                                                                                                            | ES              | Fundamentals of Computing and Programming                   | 3                               | 0        | 0        | 3        |
| BBA101                                                                                                                                                                            | HS              | Personality Development                                     | 1                               | 1        | 0        | 2        |
| BBT 102                                                                                                                                                                           | BS              | Biology for Engineers                                       | 2                               | 0        | 0        | 2        |
| BME101                                                                                                                                                                            | ES              | Engineering Graphics – E                                    | 2                               | 0        | 3        | 4        |
| BME103                                                                                                                                                                            | ES              | Basic Mechanical Engineering                                | 2                               | 0        | 0        | 2        |
| <b>PRACTICAL</b>                                                                                                                                                                  |                 |                                                             |                                 |          |          |          |
| BCM1L1                                                                                                                                                                            | ES              | Basic Civil and Mechanical Engineering Practices Laboratory | 0                               | 0        | 3        | 1        |
| BPC1L1/1L<br>2 #                                                                                                                                                                  | BS              | Physics and Chemistry Laboratory                            | 0                               | 0        | 3        | 0        |
| BSS1L4/<br>BSS1L5/<br>BSS1L6                                                                                                                                                      | HS              | NCC/NSS/NSO to be conducted during week ends                | 0                               | 1        | 2        | 1        |
| # Laboratory Classes on alternate weeks for Physics and Chemistry. The Lab examinations will be held only in the second semester (including the first semester experiments also). |                 |                                                             |                                 |          |          |          |
| <b>Total No. of Contact Hours: 37</b>                                                                                                                                             |                 |                                                             | <b>Total No. of Credits: 27</b> |          |          |          |

| SEMESTER II                                                                                                                                                                                                                                                                                                                              |          |                                                                    |                                 |   |     |   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------|---------------------------------|---|-----|---|
| Code No.                                                                                                                                                                                                                                                                                                                                 | Category | Course Title                                                       | L                               | T | P   | C |
| THEORY                                                                                                                                                                                                                                                                                                                                   |          |                                                                    |                                 |   |     |   |
| BEN201                                                                                                                                                                                                                                                                                                                                   | HS       | English – II                                                       | 3                               | 1 | 0   | 3 |
| BMA201                                                                                                                                                                                                                                                                                                                                   | BS       | Mathematics – II                                                   | 3                               | 1 | 0   | 3 |
| BPH201                                                                                                                                                                                                                                                                                                                                   | BS       | Engineering Physics – II                                           | 3                               | 0 | 0   | 3 |
| BCH201                                                                                                                                                                                                                                                                                                                                   | BS       | Engineering Chemistry – II                                         | 3                               | 0 | 0   | 3 |
| BFI 201*                                                                                                                                                                                                                                                                                                                                 | HS       | Foreign / Indian Language                                          | 3                               | 0 | 0   | 3 |
| BME202                                                                                                                                                                                                                                                                                                                                   | ES       | Engineering Mechanics                                              | 3                               | 1 | 0   | 3 |
| BEE201                                                                                                                                                                                                                                                                                                                                   | ES       | Basics Electrical and Electronics Engineering                      | 2                               | 0 | 0   | 2 |
| PRACTICAL                                                                                                                                                                                                                                                                                                                                |          |                                                                    |                                 |   |     |   |
| BCS2L2                                                                                                                                                                                                                                                                                                                                   | ES       | Computer Practices Lab                                             | 0                               | 0 | 3   | 1 |
| BEE2L1                                                                                                                                                                                                                                                                                                                                   | ES       | Basics Electrical and Electronics Engineering Practices Laboratory | 0                               | 0 | 3   | 1 |
| BPC2L1#                                                                                                                                                                                                                                                                                                                                  | BS       | Physics and Chemistry Laboratory                                   | 0                               | 0 | 3/3 | 1 |
| BSS1L7/BS<br>S2L7                                                                                                                                                                                                                                                                                                                        | HS       | Yoga                                                               | 0                               | 1 | 2   | 1 |
| <p>*Any one of the following courses: BFR201 – French, BGM201-German, BJP201 – Japanese, BKR201 – Korean, BCN201 – Chinese, BTM201 – Tamil.</p> <p># Laboratory Classes on alternate weeks for Physics and Chemistry. The Lab examinations will be held only in the second semester (including the first semester experiments also).</p> |          |                                                                    |                                 |   |     |   |
| <b>Total No. of Contact Hours: 35</b>                                                                                                                                                                                                                                                                                                    |          |                                                                    | <b>Total No. of Credits: 24</b> |   |     |   |

| SEMESTER III                   |          |                           |                          |   |   |   |
|--------------------------------|----------|---------------------------|--------------------------|---|---|---|
| Code No.                       | Category | Course Title              | L                        | T | P | C |
| THEORY                         |          |                           |                          |   |   |   |
| BMA301                         | BS       | Mathematics III           | 3                        | 2 | 0 | 4 |
| BCE301                         | PC       | Applied Mechanics         | 4                        | 0 | 0 | 4 |
| BCE302                         | PC       | Surveying I               | 3                        | 0 | 0 | 3 |
| BCE303                         | PC       | Building Construction     | 3                        | 0 | 0 | 3 |
| BCE304                         | PC       | Fluid Mechanics           | 3                        | 0 | 0 | 3 |
| BCE305                         | PC       | Engineering Earth Science | 3                        | 0 | 0 | 3 |
| PRACTICAL                      |          |                           |                          |   |   |   |
| BCE3L1                         | PC       | Surveying Practical – I   | 0                        | 0 | 3 | 2 |
| BCE3L2                         | PC       | Strength Of Materials Lab | 0                        | 0 | 3 | 2 |
| Total No. of Contact Hours: 27 |          |                           | Total No. of Credits: 24 |   |   |   |

| SEMESTER IV                    |          |                            |                          |   |   |   |
|--------------------------------|----------|----------------------------|--------------------------|---|---|---|
| Code No.                       | Category | Course Title               | L                        | T | P | C |
| THEORY                         |          |                            |                          |   |   |   |
| BMA402                         | BS       | Numerical Methods          | 3                        | 2 | 0 | 4 |
| BCE401                         | PC       | Theory of Structures       | 4                        | 0 | 0 | 4 |
| BCE402                         | PC       | Surveying II               | 3                        | 0 | 0 | 3 |
| BCE403                         | PC       | Soil Mechanics             | 3                        | 0 | 0 | 3 |
| BCE404                         | PC       | Basic Structural Design    | 4                        | 0 | 0 | 4 |
| BCE405                         | PC       | Transportation Engineering | 3                        | 0 | 0 | 3 |
| BCE406                         | BS       | Environmental Studies      | 3                        | 0 | 0 | 3 |
| PRACTICAL                      |          |                            |                          |   |   |   |
| BCE4L1                         | PC       | Surveying Practical II     | 0                        | 0 | 3 | 2 |
| BCE4L2                         | PC       | Soil Mechanics Lab         | 0                        | 0 | 3 | 2 |
| Total No. of Contact Hours: 31 |          |                            | Total No. of Credits: 28 |   |   |   |

| SEMESTER V                     |          |                                    |                          |   |   |   |
|--------------------------------|----------|------------------------------------|--------------------------|---|---|---|
| Code No.                       | Category | Course Title                       | L                        | T | P | C |
| THEORY                         |          |                                    |                          |   |   |   |
| BCE501                         | PC       | Structural Analysis – I            | 4                        | 0 | 0 | 4 |
| BCE502                         | PC       | Applied Hydraulic Engineering      | 3                        | 0 | 0 | 3 |
| BCE503                         | PC       | Foundation Engineering             | 3                        | 0 | 0 | 3 |
| BCE504                         | PC       | Reinforced Concrete Structures - I | 4                        | 0 | 0 | 4 |
| BCE505                         | PC       | Environmental Engineering          | 3                        | 0 | 0 | 3 |
| BCE507                         | PC       | Construction Technology            | 3                        | 0 | 0 | 3 |
| BCE5E1                         | CE       | Core Elective – I                  | 3                        | 0 | 0 | 3 |
| PRACTICAL                      |          |                                    |                          |   |   |   |
| BCE5L1                         | PC       | Construction Engineering Lab       | 0                        | 0 | 3 | 2 |
| BCE5L2                         | PC       | Fluid Mechanics and Machinery Lab  | 0                        | 0 | 3 | 2 |
| BCE5C1                         | PR       | Comprehension I                    | 0                        | 0 | 0 | 1 |
| Total No. of Contact Hours: 29 |          |                                    | Total No. of Credits: 28 |   |   |   |

| SEMESTER VI                    |          |                                         |                          |   |   |   |
|--------------------------------|----------|-----------------------------------------|--------------------------|---|---|---|
| Code No.                       | Category | Course Title                            | L                        | T | P | C |
| THEORY                         |          |                                         |                          |   |   |   |
| BCE601                         | PC       | Structural Analysis – II                | 4                        | 0 | 0 | 4 |
| BCE602                         | PC       | Reinforced Concrete Structures - II     | 4                        | 0 | 0 | 4 |
| BCE603                         | PC       | Irrigation Engineering- II              | 3                        | 0 | 0 | 3 |
| BSS601                         | HS       | Value Education and Professional Ethics | 3                        | 0 | 0 | 3 |
| BCE6E2                         | CE       | Core Elective –II                       | 3                        | 0 | 0 | 3 |
| BCE6E3                         | NE       | Non Major Elective –I                   | 3                        | 0 | 0 | 3 |
| Practical                      |          |                                         |                          |   |   |   |
| BCE6L1                         | PC       | Computer Aided Building Drawing         | 0                        | 0 | 3 | 2 |
| BCE6L2                         | PC       | Environmental Engineering Lab           | 0                        | 0 | 3 | 2 |
| BCE6P1                         | PR       | Term Paper                              | 0                        | 0 | 4 | 2 |
| Total No. of Contact Hours: 30 |          |                                         | Total No. of Credits: 26 |   |   |   |

| SEMESTER VII                          |          |                                                                                       |                                 |   |   |   |
|---------------------------------------|----------|---------------------------------------------------------------------------------------|---------------------------------|---|---|---|
| Code No.                              | Category | Course Title                                                                          | L                               | T | P | C |
| <b>Theory</b>                         |          |                                                                                       |                                 |   |   |   |
| BCE701                                | PC       | Estimation & Costing                                                                  | 3                               | 0 | 0 | 3 |
| BCE702                                | PC       | Computer Aided Design of Structures                                                   | 4                               | 0 | 0 | 4 |
| BCE703                                | PC       | Design of Steel Structures                                                            | 4                               | 0 | 0 | 4 |
| BCE704                                | PC       | Management Concepts For Civil Engineers                                               | 3                               | 0 | 0 | 3 |
| BCE7E4                                | CE       | Core Elective – III                                                                   | 3                               | 0 | 0 | 3 |
| BCE7E5                                | OE       | Open Elective – I                                                                     | 3                               | 0 | 0 | 3 |
| <b>Practical</b>                      |          |                                                                                       |                                 |   |   |   |
| BCE7L1                                | PC       | Computer Aided Design Of Structures Laboratory                                        | 0                               | 0 | 3 | 2 |
| BCE7L2                                | PC       | Computer Aided Design and Drafting Laboratory(R.C.C, Steel, Irrigation & Environment) | 0                               | 0 | 3 | 2 |
| BCE7V1                                | PR       | In-plant Training (End of 6th Semester -30days)                                       | 0                               | 0 | 0 | 1 |
| <b>Total No. of Contact Hours: 26</b> |          |                                                                                       | <b>Total No. of Credits: 25</b> |   |   |   |

| SEMESTER VIII                         |          |                            |                                 |   |    |   |
|---------------------------------------|----------|----------------------------|---------------------------------|---|----|---|
| Code No.                              | Category | Course Title               | L                               | T | P  | C |
| <b>Theory</b>                         |          |                            |                                 |   |    |   |
| BCE8E6                                | NE       | Non Major Elective – II    | 3                               | 0 | 0  | 3 |
| BCE8E7                                | OE       | Open Elective – II         | 3                               | 0 | 0  | 3 |
| <b>Practical</b>                      |          |                            |                                 |   |    |   |
| BCE8C1                                | PR       | Comprehension I            | 0                               | 0 | 0  | 1 |
| BCE8P1                                | PR       | Project Work and Viva Voce | 0                               | 0 | 18 | 9 |
| <b>Total No. of Contact Hours: 24</b> |          |                            | <b>Total No. of Credits: 16</b> |   |    |   |

**OVERALL CREDITS FOR THE PROGRAMME: 198**

**SUMMARY OF CURRICULUM STRUCTURE AND CREDIT & CONTACT  
HOUR DISTRIBUTION**

| S.No | Sub Area                                                          | Credit as per Semester |    |     |    |    |    |         |      | No. of<br>Credit | % of<br>credit |
|------|-------------------------------------------------------------------|------------------------|----|-----|----|----|----|---------|------|------------------|----------------|
|      |                                                                   | I                      | II | III | IV | V  | VI | VI<br>I | VIII |                  |                |
| 1    | Humanities & Social<br>Sciences (HS)                              | 6                      | 7  | -   | -  | -  | 3  |         | -    | 16               | 08.08          |
| 2    | Maths & Basic<br>Sciences (BS)                                    | 11                     | 10 | 4   | 7  | -  | -  | -       | -    | 32               | 16.16          |
| 3    | Engineering<br>Sciences (ES)                                      | 10                     | 7  | -   | -  | -  | -  | -       | -    | 17               | 08.59          |
| 4    | Professional Core<br>(PC)                                         | -                      | -  | 20  | 18 | 24 | 15 | 18      | -    | 95               | 47.80          |
| 5    | Core Electives<br>(PE)                                            | -                      | -  | -   | -  | 3  | 3  | 3       |      | 9                | 04.55          |
| 6    | Non major Electives<br>(NE)                                       | -                      | -  | -   | -  | -  | -  | 3       | 3    | 6                | 03.03          |
| 7    | Open Electives (OE)                                               | -                      | -  | -   | -  | -  | -  | 3       | 3    | 6                | 03.03          |
| 8    | Project Work,<br>Seminar, Internship,<br>Term Paper, etc.<br>(PR) | -                      | -  | -   |    | 1  | 2  | 1       | 10   | 14               | 07.07          |
|      | <b>Total Credits</b>                                              | 27                     | 24 | 24  | 25 | 28 | 26 | 25      | 16   | 198              | 100            |
|      | <b>Total Contact Hours</b>                                        | 37                     | 35 | 27  | 31 | 29 | 30 | 26      | 24   | 236              |                |

## LIST OF ELECTIVES

### List of Core Elective (CE) -I:

| Code No. | Course Title                                  | L | T | P | C |
|----------|-----------------------------------------------|---|---|---|---|
| BCE051   | Concrete Technology                           | 3 | 0 | 0 | 3 |
| BCE052   | Industrial Structures                         | 3 | 0 | 0 | 3 |
| BCE053   | Advanced Construction Techniques              | 3 | 0 | 0 | 3 |
| BCE054   | Construction Planning, Scheduling and Control | 3 | 0 | 0 | 3 |
| BCE055   | Industrial Waste Treatment and Disposal       | 3 | 0 | 0 | 3 |
| BCE056   | Solid and Hazardous Waste Management          | 3 | 0 | 0 | 3 |

### List of Core Elective (CE) -II:

| Code No. | Course Title                     | L | T | P | C |
|----------|----------------------------------|---|---|---|---|
| BCE057   | Design of R.C. Framed Structures | 3 | 0 | 0 | 3 |
| BCE058   | Tall Structures                  | 3 | 0 | 0 | 3 |
| BCE059   | Safety Practices in Construction | 3 | 0 | 0 | 3 |
| BCE060   | Modern Construction Materials    | 3 | 0 | 0 | 3 |
| BCE061   | Air and Noise Pollution          | 3 | 0 | 0 | 3 |
| BCE062   | Environmental Impact Assessment  | 3 | 0 | 0 | 3 |

### List of Core Elective(CE) -III:

| Code No. | Course Title                               | L | T | P | C |
|----------|--------------------------------------------|---|---|---|---|
| BCE063   | Pre stressed Concrete Structures           | 3 | 0 | 0 | 3 |
| BCE064   | Advanced Concrete Design                   | 3 | 0 | 0 | 3 |
| BCE065   | Construction Equipment                     | 3 | 0 | 0 | 3 |
| BCE066   | Prefabrication and Construction Techniques | 3 | 0 | 0 | 3 |
| BCE067   | Environmental Health Engineering           | 3 | 0 | 0 | 3 |
| BCE068   | Indoor Air Quality                         | 3 | 0 | 0 | 3 |

### List of Non Major Elective (NE) - I:

| Code No. | Course Title                                            | L | T | P | C |
|----------|---------------------------------------------------------|---|---|---|---|
| BCE069   | Matrix Methods of Structural Analysis                   | 3 | 0 | 0 | 3 |
| BCE070   | Concrete Structures                                     | 3 | 0 | 0 | 3 |
| BCE071   | Shoring, Scaffolding and Formwork                       | 3 | 0 | 0 | 3 |
| BCE072   | Construction Project Management                         | 3 | 0 | 0 | 3 |
| BCE073   | Ground Water Contamination and Transport Modeling       | 3 | 0 | 0 | 3 |
| BCE074   | Physical and Chemical Treatment of Water and Wastewater | 3 | 0 | 0 | 3 |
| BCE075   | Ground Water Engineering                                | 3 | 0 | 0 | 3 |
| BCE076   | Coastal Engineering                                     | 3 | 0 | 0 | 3 |

**List of Non Major Elective (NE) -II:**

| Code No. | Course Title                                  | L | T | P | C |
|----------|-----------------------------------------------|---|---|---|---|
| BCE077   | Finite Element Analysis                       | 3 | 0 | 0 | 3 |
| BCE078   | Structures on Expansive Soil                  | 3 | 0 | 0 | 3 |
| BCE079   | Quality Control and Assurance in Construction | 3 | 0 | 0 | 3 |
| BCE080   | Construction Personnel Management             | 3 | 0 | 0 | 3 |
| BCE081   | Water and Sewage Conveyance                   | 3 | 0 | 0 | 3 |
| BCE082   | Environmental Engineering Structures          | 3 | 0 | 0 | 3 |
| BCE083   | Soil Dynamics and Machine Foundation          | 3 | 0 | 0 | 3 |
| BCE084   | Hydrology                                     | 3 | 0 | 0 | 3 |

**List of Non Major Elective (NE) -III:**

| Code No. | Course Title                                   | L | T | P | C |
|----------|------------------------------------------------|---|---|---|---|
| BCE085   | Concrete Bridges                               | 3 | 0 | 0 | 3 |
| BCE086   | Maintenance and Rehabilitation of Structures   | 3 | 0 | 0 | 3 |
| BCE087   | Project Formulation and Appraisal              | 3 | 0 | 0 | 3 |
| BCE088   | GIS in Construction Engineering & Management   | 3 | 0 | 0 | 3 |
| BCE089   | Environmental Quality Modeling                 | 3 | 0 | 0 | 3 |
| BCE090   | Marine Pollution Monitoring                    | 3 | 0 | 0 | 3 |
| BCE091   | Operation and Management of Irrigation Systems | 3 | 0 | 0 | 3 |
| BCE092   | Transportation Structures                      | 3 | 0 | 0 | 3 |

**List of Open Elective (OE) -I:**

| Code No. | Course Title                 | L | T | P | C |
|----------|------------------------------|---|---|---|---|
| BCE093   | Remote Sensing and GIS       | 3 | 0 | 0 | 3 |
| BBA008   | Total Quality Management     | 3 | 0 | 0 | 3 |
| BCE094   | Optimization Techniques      | 3 | 0 | 0 | 3 |
| BBA009   | Intellectual Property Rights | 3 | 0 | 0 | 3 |
|          | NSS Paper I                  | 2 | 0 | 2 | 3 |

**List of Open Elective (OE) -II:**

| Code No. | Course Title                  | L | T | P | C |
|----------|-------------------------------|---|---|---|---|
| BCE095   | Geographic Information System | 3 | 0 | 0 | 3 |
| BCE096   | Engineering Economics         | 3 | 0 | 0 | 3 |
| BCE097   | Renewable Sources of Energy   | 3 | 0 | 0 | 3 |
|          | NSS Paper II                  | 2 | 0 | 2 | 3 |
|          | Massive Open Online Course    | 3 | 0 | 0 | 3 |

|                                                                                                                                      |                                                                                                                             |                                                        |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                              |
|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-----------------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|------------------------------|
| BEN101                                                                                                                               |                                                                                                                             | ENGLISH - I                                            |                             |   |                    |   |                        |   |                    | L | T                       | P | C                  |                              |
|                                                                                                                                      |                                                                                                                             | Total Contact Hours – 60                               |                             |   |                    |   |                        |   |                    | 3 | 1                       | 0 | 3                  |                              |
|                                                                                                                                      |                                                                                                                             | Prerequisite – +2 Level English                        |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                              |
|                                                                                                                                      |                                                                                                                             | Course Designed by – Dept of English                   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                              |
| OBJECTIVES                                                                                                                           |                                                                                                                             |                                                        |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                              |
| To make the students learn the basic modes of communication for fluency and attainment of confidence in speech, reading and writing. |                                                                                                                             |                                                        |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                              |
| COURSE OUTCOMES (COs)                                                                                                                |                                                                                                                             |                                                        |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                              |
| CO1                                                                                                                                  | Understand the importance of being responsible, logical, and thorough.                                                      |                                                        |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                              |
| CO2                                                                                                                                  | Respond to the situations where short reports and instructions are required.                                                |                                                        |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                              |
| CO3                                                                                                                                  | Explain “how things work”, and what to suggest when “things don’t work                                                      |                                                        |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                              |
| CO4                                                                                                                                  | Develop our confidence and authority in the practical use of language.                                                      |                                                        |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                              |
| CO5                                                                                                                                  | Understand the importance of being responsible, logical, and thorough.                                                      |                                                        |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                              |
| CO6                                                                                                                                  | e to Face interviews and competitive examinations                                                                           |                                                        |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                              |
|                                                                                                                                      | Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                        |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                              |
| 1                                                                                                                                    | COs/POs                                                                                                                     | a                                                      | b                           | C | d                  | e | f                      | g | h                  | i | j                       | k | l                  |                              |
| 2                                                                                                                                    | CO1                                                                                                                         | H                                                      | H                           | H | H                  | H | M                      | L | L                  | H | H                       | H | H                  |                              |
|                                                                                                                                      | CO2                                                                                                                         |                                                        |                             |   |                    |   |                        | L |                    |   |                         |   |                    |                              |
|                                                                                                                                      | CO3                                                                                                                         | H                                                      |                             |   |                    |   |                        | H |                    | H |                         |   | H                  |                              |
|                                                                                                                                      | CO4                                                                                                                         | H                                                      | M                           |   |                    |   | M                      | L | H                  | H |                         |   | H                  |                              |
|                                                                                                                                      | CO5                                                                                                                         |                                                        |                             |   |                    |   |                        | L |                    |   |                         |   |                    |                              |
|                                                                                                                                      | CO6                                                                                                                         | H                                                      |                             | H | H                  | H | H                      | L |                    | H | H                       | M | H                  |                              |
| 3                                                                                                                                    | Category                                                                                                                    | Humanities & Social Studies (HS)                       | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) |   | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ |
|                                                                                                                                      |                                                                                                                             | √                                                      |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                              |
| 4                                                                                                                                    | Approval                                                                                                                    | 37 <sup>th</sup> Meeting of Academic Council, May 2015 |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                              |

## UNIT I STRUCTURES<sup>12</sup>

Parts of speech - Active and passive voices - Subject verb agreement. - Writing about School life, Hobbies, Family and friends – Word formation with prefixes and suffixes - Tenses - Concord - Summarizing - Note-making

## UNIT II TRANSCODING

12

Cause and effect relations – Punctuations –Differences between verbal and nonverbal communication -E - mail communication – Homophones - Etiquettes of E mail communication. Interpreting graphic representation - Flow chart and Bar chart.

**UNIT III REPORTING****12**

Degrees of comparison – Positive, Comparative, Superlative - questions- SI units -Lab reports - Physics chemistry, workshop and Survey report for introducing new product in the market.

**UNIT IV FORMAL DOCUMENTATION****12**

Writing project proposals - Presentation skills - Prefixes and suffixes - If conditions - Writing a review-Preparing minutes of the meeting, Agenda, official circulars.

**UNIT V METHODOLOGY****12**

Accident reports (due to flood and fire) - Hints development - Imperatives - Marking the stress Connectives , prepositional relatives.

**TEXT BOOK**

1. Department Of Humanities and Social Sciences Division, Anna University, Oxford University Press, 2013.

**REFERENCES:**

1. S.P.Danavel, English and Communication for Students of Science and Engineering, Orient Blackswan, Chennai, 2011.
2. Rizvi, M.Asharaf, Effective Technical Communication, New Delhi, Tata McGraw Hill Publishibg Company, 2007.
3. Murali Krishna and Sunitha Moishra, Communication Skills for Engineers . Pearson, New Delhi, 2011.

|                                                                                                                                        |                                                                              |          |          |          |          |
|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|----------|----------|----------|----------|
| <b>BMA101</b>                                                                                                                          | <b>MATHEMATICS I</b>                                                         | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                                                        | Total Contact Hours - 60                                                     | 3        | 1        | 0        | 3        |
|                                                                                                                                        | Prerequisite – + 2 Level Mathematics                                         |          |          |          |          |
|                                                                                                                                        | Course Designed by – Dept of Mathematics                                     |          |          |          |          |
| <b>OBJECTIVES</b>                                                                                                                      |                                                                              |          |          |          |          |
| To make the students learn Mathematics in order to formulate and solve problems effectively in their respective fields of engineering. |                                                                              |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                           |                                                                              |          |          |          |          |
| CO1                                                                                                                                    | Study the fundamentals of mathematics                                        |          |          |          |          |
| CO2                                                                                                                                    | Students learn multiple integral techniques                                  |          |          |          |          |
| CO3                                                                                                                                    | Students gain knowledge in application of variables                          |          |          |          |          |
| CO4                                                                                                                                    | Find area and volume based on a function with one or more variables.         |          |          |          |          |
| CO5                                                                                                                                    | Apply matrix operations to solve relevant real life problems in engineering. |          |          |          |          |
| CO6                                                                                                                                    | Formulate a mathematical model for three dimensional objects and solve       |          |          |          |          |

| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                |                              |   |                          |                           |                          |                               |                          |                                                    |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------|------------------------------|---|--------------------------|---------------------------|--------------------------|-------------------------------|--------------------------|----------------------------------------------------|---|---|---|
| 1                                                                                                                           | COs/POs  | a                                                              | b                            | c | D                        | e                         | f                        | g                             | h                        | i                                                  | j | k | l |
| 2                                                                                                                           | CO1      |                                                                |                              |   |                          |                           |                          |                               |                          |                                                    |   |   |   |
|                                                                                                                             | CO2      |                                                                |                              | M |                          | H                         |                          |                               |                          |                                                    |   |   |   |
|                                                                                                                             | CO3      |                                                                | H                            |   |                          |                           | M                        |                               |                          |                                                    |   |   |   |
|                                                                                                                             | CO4      |                                                                |                              |   |                          |                           |                          |                               | L                        |                                                    |   |   |   |
|                                                                                                                             | CO5      |                                                                |                              |   |                          |                           |                          | H                             |                          |                                                    | L |   |   |
|                                                                                                                             | CO6      |                                                                |                              |   |                          |                           |                          |                               |                          |                                                    |   | L |   |
| 3                                                                                                                           | Category | Humanities<br>& Social<br>Studies                              | Basic<br>Sciences<br>& Maths |   | Engg<br>Sciences<br>(ES) | Professional<br>Core (PC) | Core<br>Elective<br>(CE) | Non-Major<br>Elective<br>(NE) | Open<br>Elective<br>(OE) | Project/Term Paper/<br>Seminar/<br>Internship (PR) |   |   |   |
|                                                                                                                             |          |                                                                |                              | √ |                          |                           |                          |                               |                          |                                                    |   |   |   |
| 4                                                                                                                           | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                              |   |                          |                           |                          |                               |                          |                                                    |   |   |   |

### UNIT I MATRICES

12

Characteristic equations- Eigen values and eigen vectors of the real matrix- Properties- Cayley-Hamilton theorem(Excluding proof)- Orthogonal transformation of a symmetric matrix to diagonal form- Quadratic form- Reduction of quadratic form to canonical form by orthogonal transformation.

### UNIT II THREE DIMENSIONAL ANALYTICAL GEOMETRY

12

Equation of a Sphere- Plane section of a sphere- Tangent plane- Equation of cone- Right circular cone- Equation of a cylinder- Right circular cylinder.

### UNIT III DIFFERENTIAL CALCULUS

12

Curvature in Cartesian coordinates- Centre and radius of curvature- Circle of curvature- Evolutes-Envelopes- Applications of Evolutes and Envelopes.

### UNIT IV FUNCTIONS OF SEVERAL VARIABLES

12

Partial derivatives- Euler's theorem for homogeneous functions- Total derivatives- Differentiation of implicit functions- Jacobians- Taylor's expansion- Maxima and Minima- Method of Lagrangian multipliers.

### UNIT V MULTIPLE INTEGRALS

12

Double integration- Cartesian and Polar coordinates- Change of order of integration- Change of variables between Cartesian and Polar coordinates- Triple integration in Cartesian coordinates- Area as double integral- Volume as triple integral.

### TEXT BOOK:

1. Ravish R.Singh and Mukkul Bhatt, "Engineering Mathematics-I" First Reprint, Tata McGraw Hill Pub Co., New Delhi. 2011.
2. Grewal.B.S, "Higher Engineering Mathematics", 40<sup>th</sup> Edition, Khanna Publications, Delhi.

2007.

## REFERENCES:

1. Ramana.B.V. "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2007.
2. Glyn James, "Advanced Engineering Mathematics", 7<sup>th</sup> Edition, Pearson Education, 2007.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, John Wiley and Sons, New York, 2003.
4. Murray R. Spiegel, "Advanced Calculus", Schaum's Outline Series, First Edn, McGraw Hill Intl Book Co., New Delhi, 1981.

|                                                                                                                             |                                                                                     |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|----------------------------------------------|---|---|---|---|---|
| PH101                                                                                                                       | ENGINEERING PHYSICS I                                                               |                                                                |                             |                    |                        |                    |                         |                    |                                              |   | L | T | P | C |
|                                                                                                                             | Total Contact Hours - 45                                                            |                                                                |                             |                    |                        |                    |                         |                    |                                              |   | 3 | 0 | 0 | 3 |
|                                                                                                                             | Prerequisite – +2 level Physics                                                     |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |   |
|                                                                                                                             | Course Designed by – Department of Physics                                          |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |   |
| OBJECTIVES:                                                                                                                 |                                                                                     |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |   |
| To enhance the fundamental knowledge in Physics and its applications relevant to various stre of Engineering and Technology |                                                                                     |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |   |
| COURSE OUTCOMES (COs)                                                                                                       |                                                                                     |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |   |
| CO1                                                                                                                         | Understand the Principles and Laws of Physics                                       |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |   |
| CO2                                                                                                                         | To understand the impact of Crystal Physics                                         |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |   |
| CO3                                                                                                                         | Learn the Properties of Elasticity and Heat transfer.                               |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |   |
| CO4                                                                                                                         | Acquire Knowledge on Quantum Physics.                                               |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |   |
| CO5                                                                                                                         | Understand the concepts on Laser & Ultrasonic’s and its Applications                |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |   |
| CO6                                                                                                                         | Understand the Principle of Laser and its Applications in Engineering and Medicine. |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                     |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |   |
| 1                                                                                                                           | COs/POs                                                                             | A                                                              | b                           | C                  | d                      | e                  | f                       | g                  | h                                            | i | j | k | l |   |
| 2                                                                                                                           | CO1                                                                                 | H                                                              |                             |                    |                        |                    |                         | M                  |                                              |   | H |   |   |   |
|                                                                                                                             | CO2                                                                                 |                                                                | L                           | H                  |                        | M                  |                         |                    |                                              | M |   | L | H |   |
|                                                                                                                             | CO3                                                                                 |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |   |
|                                                                                                                             | CO4                                                                                 | H                                                              |                             | M                  | L                      |                    |                         |                    |                                              |   | L |   | M |   |
|                                                                                                                             | CO5                                                                                 |                                                                | L                           | L                  |                        |                    |                         |                    |                                              |   |   | L | L |   |
|                                                                                                                             | CO6                                                                                 |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |   |
| 3                                                                                                                           | Category                                                                            | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |   |   |   |   |
|                                                                                                                             |                                                                                     |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |   |
| 4                                                                                                                           | Approval                                                                            | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |   |

## UNIT I CRYSTAL PHYSICS

9

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Diamond and graphite structures (qualitative

treatment)- Crystal growth techniques –solution, melt (Bridgman and Czochralski) and vapour growth techniques (qualitative)

## UNIT II PROPERTIES OF MATTER AND THERMAL PHYSICS 9

Elasticity-Hooke's law - Relationship between three moduli of elasticity (qualitative) – stress-strain diagram – Poisson's ratio –Factors affecting elasticity –Bending moment – Depression of a cantilever –Young's modulus by uniform bending- I-shaped girders Modes of heat transfer-thermal conductivity- Newton's law of cooling - Linear heat flow – Lee's disc method – Radial heat flow – Rubber tube method – conduction through compound media (series and parallel).

## UNIT III QUANTUM PHYSICS 9

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh – Jeans' Law from Planck's theory – Compton effect. Theory and experimental verification – Properties of Matter waves – G.P Thomson experiment-Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box - Electron microscope - Scanning electron microscope - Transmission electron microscope.

## UNIT IV      ACOUSTICS AND ULTRASONICS      9

Classification of Sound- decibel- Weber–Fechner law – Sabine’s formula- derivation using growth and decay method – Absorption Coefficient and its determination –factors affecting acoustics of buildings and their remedies. Production of ultrasonics by magnetostriction and piezoelectric methods - acoustic grating -Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C – scan displays, Medical applications – Sonogram.

## UNIT V PHOTONICS AND FIBRE OPTICS 9

Spontaneous and stimulated emission- Population inversion –Einstein's A and B coefficients - derivation. Types of lasers – Nd:YAG, CO<sub>2</sub>, Semiconductor lasers (homo junction & hetero junction)- Industrial and Medical Applications. Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) – attenuation, dispersion, bending - Fibre Optical Communication system (Block diagram) - Active and passive fibre sensors- Endoscope.

**TEXT BOOKS:**

1. Jayaraman D Engineering Physics I. Global Publishing House, 2014.
2. Arumugam M. Engineering Physics. Anuradha publishers, 2010.
3. Gaur R.K. and Gupta S.L. Engineering Physics. Dhanpat Rai Publishers, 2009.
4. Mani Naidu S. Engineering Physics, Second Edition, PEARSON Publishing, 2011.

## REFERENCES:

1. Searls and Zemansky. University Physics, 2009
2. Marikani A. Engineering Physics. PHI Learning Pvt., India, 2009.
3. Palanisamy P.K. Engineering Physics. SCITECH Publications, 2011.
4. <http://ocw.mit.edu/courses/find-by-topic>
5. <http://nptel.ac.in/course.php?disciplineId=122>
6. [https://en.wikipedia.org/wiki/Engineering\\_physics](https://en.wikipedia.org/wiki/Engineering_physics)

|                                                                                                                                                        |                                                                                                                      |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|----------------------------------------------|----------|----------|----------|----------|
| <b>BCH101</b>                                                                                                                                          | <b>ENGINEERING CHEMISTRY - I</b>                                                                                     |                                                                |                             |                    |                        |                    |                         |                    |                                              | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                                                                        | Total Contact Hours - 45                                                                                             |                                                                |                             |                    |                        |                    |                         |                    |                                              | 3        | 0        | 0        | 3        |
|                                                                                                                                                        | Prerequisite – +2 Level Chemistry                                                                                    |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |          |
|                                                                                                                                                        | Course Designed by – Department of Chemistry                                                                         |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |          |
| <b>OBJECTIVES</b>                                                                                                                                      |                                                                                                                      |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |          |
| To impart a sound knowledge on the principles of chemistry involving the different applications oriented topics required for all engineering branches. |                                                                                                                      |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                           |                                                                                                                      |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |          |
| CO1                                                                                                                                                    | Understand the principles of water characterization and treatment for portable industrial purposes.                  |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |          |
| CO2                                                                                                                                                    | To impart knowledge on the essential aspects of Principles of polymer chemistry engineering applications of polymers |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |          |
| CO3                                                                                                                                                    | Having a sound knowledge in the Field of the Conventional and non-Conventional energy                                |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |          |
| CO4                                                                                                                                                    | To impart knowledge on the essential aspects of electrochemical cells, emf applications of EMF measurements          |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |          |
| CO5                                                                                                                                                    | To make the students understand the Principles of corrosion and corrosion control .                                  |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |          |
| CO6                                                                                                                                                    | To impart knowledge about the Conventional and non-conventional energy sources energy storage devices                |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |          |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                            |                                                                                                                      |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |          |
| 1                                                                                                                                                      | COs/POs                                                                                                              | a                                                              | b                           | c                  | d                      | e                  | f                       | g                  | h                                            | i        | J        | k        | L        |
| 2                                                                                                                                                      | CO1                                                                                                                  | H                                                              |                             |                    |                        |                    |                         | H                  |                                              |          |          |          |          |
|                                                                                                                                                        | CO2                                                                                                                  |                                                                | L                           | H                  |                        | M                  |                         |                    |                                              |          |          |          |          |
|                                                                                                                                                        | CO3                                                                                                                  |                                                                | M                           |                    | H                      |                    |                         |                    |                                              |          |          |          |          |
|                                                                                                                                                        | CO4                                                                                                                  | H                                                              |                             | M                  | L                      |                    |                         | H                  |                                              |          |          |          |          |
|                                                                                                                                                        | CO5                                                                                                                  |                                                                | L                           | L                  |                        |                    |                         |                    |                                              |          |          |          |          |
|                                                                                                                                                        | CO6                                                                                                                  | H                                                              |                             |                    |                        |                    |                         | H                  |                                              |          |          |          |          |
| 3                                                                                                                                                      | Category                                                                                                             | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |          |          |          |          |
|                                                                                                                                                        |                                                                                                                      |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |          |
| 4                                                                                                                                                      | Approval                                                                                                             | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                              |          |          |          |          |

## UNIT I WATER TECHNOLOGY

9

Introduction-Characteristics : Hardness of water – types - temporary and permanent hardness - estimation by EDTA method Alkalinity – types of alkalinity - Phenolphthalein and Methyl orange alkalinity - determination –Domestic water treatment – disinfection methods (Chlorination, Ozonation , UV treatment) Boiler feed water – requirements – disadvantages of using hard water in boilers Internal conditioning (Calgon Conditioning method) – External conditioning – Demineralization process – Desalination and Reverse osmosis.

## **UNIT II POLYMERS**

**9**

Introduction-Polymers- definition – polymerization – degree of polymerization - types of polymerization– Addition polymerization and Condensation polymerization – Mechanism of Polymerization - free radical polymerization mechanism only, Plastics: Classification – thermoplastics and thermosetting plastics – difference between thermoplastics and thermosetting plastics - preparation, properties and uses of PVC, Teflon, nylon-6,6, PET, Rubber :Types – drawbacks of natural rubber -vulcanization of rubber - properties and uses of vulcanized rubber Synthetic rubbers – butyl rubber and SBR

## **UNIT III ELECTRO CHEMISTRY**

**9**

Introduction CELLS: types of Electrochemical cells , Electrolytic cells – Reversible and irreversible cells EMF – measurement of EMF– Single electrode potential – Nernst equation Reference electrodes : Standard Hydrogen electrode -Calomel electrode Ion selective electrode :Glass electrode and measurement of pH using Glass electrode Electrochemical series – significance Titrations :Potentiometer titrations (redox -  $\text{Fe}^{2+}$  vs dichromate titrations) Conductometric titrations (acid-base – HCl vs, NaOH titrations)

## **UNIT IV CORROSION AND CORROSION CONTROL**

**9**

Introduction: Chemical corrosion Definition - Chemical Corrosion - Electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – mechanism of Chemical and Electrochemical corrosion factors influencing corrosion control – sacrificial anode and impressed cathodic current methods – Protective coatings :Paints– constituents of the paint and their functions Metallic coatings – electroplating of Gold and electroless plating of Nickel.

## **UNIT V NON-CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES**

**9**

Introduction : Nuclear fission and nuclear fusion reactions – differences between nuclear fission and nuclear fusion reactions – nuclear chain Reactions – nuclear energy critical mass - super critical mass - sub - critical mass Light water nuclear reactor for power generation (block diagram only) – breeder reactor Solar energy conversion – solar cells – wind energy Fuel cells – hydrogen – oxygen fuel cell Batteries :Primary and secondary Batteries – differences between Primary and secondary Batteries Secondary batteries :Lead–acid storage battery –working –uses Nickel–cadmium battery - working –uses Solid – state battery : Lithium battery

### **TEXT BOOKS:**

1. P.C.Jain and Monica Jain, “Engineering Chemistry” Dhanpat Rai Pub, Co., New Delhi (2002).
2. S.S. Dara “A text book of engineering chemistry” S.Chand & Co.Ltd., New Delhi (2006).
3. P. J. Lucia, M. Subhashini, “Engineering Chemistry, Volume 1”, Crystal Publications, Chennai, (2007).

### **REFERENCES :**

1. B.K.Sharma “Engineering chemistry” Krishna Prakasan Media (P) Ltd., Meerut (2001).
2. B. Sivasankar “Engineering Chemistry” Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
3. <http://ocw.mit.edu/courses/find-by-topic>
4. <http://nptel.ac.in/course.php?disciplineId=122>
5. <https://en.wikipedia.org/wiki/Electrochemistry>

|                                                                                                                             |                                                                           |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|----------------------------------------------|--|
| BCS101                                                                                                                      | FUNDAMENTALS OF COMPUTING AND PROGRAMMING                                 |                                                                |                             |   |                    |   |                        |   | L                  | T | P                       | C |                    |  |                                              |  |
|                                                                                                                             | Total Contact Hours - 45                                                  |                                                                |                             |   |                    |   |                        |   | 3                  | 0 | 0                       | 3 |                    |  |                                              |  |
|                                                                                                                             | Prerequisite – +2 level Physics                                           |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                             | Course Designed by – Department of Physics                                |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| OBJECTIVES                                                                                                                  |                                                                           |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| Students will understand the basics of computers and solve computer oriented problems using various computing tools.        |                                                                           |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| COURSE OUTCOMES (COs)                                                                                                       |                                                                           |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO1                                                                                                                         | Learn the fundamental principles in computing.                            |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO2                                                                                                                         | Learn to write simple programs using computer language                    |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO3                                                                                                                         | To enable the student to learn the major components of a computer system. |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO4                                                                                                                         | Computing problems                                                        |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO5                                                                                                                         | To learn to use office automation tools.                                  |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO6                                                                                                                         | To interpret and relate programs                                          |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                           |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| 1                                                                                                                           | COs/POs                                                                   | a                                                              | b                           | c | d                  | e | f                      | g | h                  | i | J                       | k | l                  |  |                                              |  |
| 2                                                                                                                           | CO1                                                                       | H                                                              |                             |   |                    |   | H                      |   |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO2                                                                       |                                                                | L                           | H |                    | M |                        |   |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO3                                                                       |                                                                | L                           |   | S                  |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO4                                                                       | M                                                              |                             | M | W                  |   | M                      |   |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO5                                                                       |                                                                | L                           | L |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO6                                                                       | H                                                              |                             |   |                    |   | H                      |   |                    |   |                         |   |                    |  |                                              |  |
| 3                                                                                                                           | Category                                                                  | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) |   | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) |  | Project/Term Paper/ Seminar/ Internship (PR) |  |
|                                                                                                                             |                                                                           |                                                                |                             |   | √                  |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| 4                                                                                                                           | Approval                                                                  | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |

## UNIT I INTRODUCTION TO COMPUTER

9

Introduction- Characteristics of computer-Evolution of Computers-Computer Generations - Classification of Computers- Basic Computer Organization-Number system. Computer Software: Types of Software—System software-Application software-Software Development Steps

## UNIT II PROBLEM SOLVING AND OFFICE AUTOMATION

9

Planning the Computer Program – Purpose – Algorithm – Flowcharts– Pseudo code Introduction to Office Packages: MS Word, Spread Sheet, Power Point, MS Access, Outlook.

**UNIT III INTRODUCTION TO C****9**

Overview of C-Constants-Variables-Keywods-Data types-Operators and Expressions. Managing Input and Output statements-Decision making-Branching and Looping statements.

**UNIT IV ARRAYS AND STRUCTURES****9**

Arrays - Handling of Character Strings - Pointers – Structures-Union -Functions – Recursion- Call by value and Call by reference.

**UNIT V INTRODUCTION TO C++****9**

Overview of C++ - Applications of C++-Classes and objects-OOPS concepts -Constructor and Destructor- A simple C++ program –Friend classes and Friend Function.

**TEXT BOOKS:**

1. Ashok, N.Kamthane,"Computer Programming", Pearson Education (2012).
2. Anita Goel and Ajay Mittal,"Computer Fundamentals and Programming in C", Dorling Kindersley (India Pvt Ltd),Pearson Education in South Asia,(2011).
3. Yashavant P. Kanetkar, "Let us C",13th Edition,BPB Publications(2013).
4. Yashavant P. Kanetkar,"Let us C++"10th Edition, BPB Publications (2013).

**REFERENCES:**

1. Pradeep K.Sinha, Priti Sinha "Foundations of Computing", BPB Publications (2013).
2. Byron Gottfried, "Programming with C", 2nd edition, (Indian Adapted Edition), TMH Publication.
3. Pradip Dey, Manas Ghosh, Fundamentals of Computing and Programming in 'C' First Edition, Oxford University Press(2009).
4. The C++ Programming Language , 4<sup>th</sup> Edition, Bjarne Stroustrup, Addison-Wesley Publishing Company (2013).

|                                                                                                 |                                                                                                                                                  |          |          |          |          |
|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|----------|----------|
| <b>BSS101</b>                                                                                   | <b>PERSONALITY DEVELOPMENT</b>                                                                                                                   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                 | Total Contact Hours - 30                                                                                                                         | 1        | 1        | 0        | 2        |
|                                                                                                 | Prerequisite – +2 Level Knowledge                                                                                                                |          |          |          |          |
|                                                                                                 | Course Designed by – Department of Management Studies                                                                                            |          |          |          |          |
| <b>OBJECTIVES</b>                                                                               |                                                                                                                                                  |          |          |          |          |
| To make students groom their personality and prove themselves as good Samaritans of the society |                                                                                                                                                  |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                    |                                                                                                                                                  |          |          |          |          |
| CO1                                                                                             | Individual or in-group class presentations pertaining to the applications of concepts theories or issues in human development..                  |          |          |          |          |
| CO2                                                                                             | Scores obtained from essay and or objective tests.                                                                                               |          |          |          |          |
| CO3                                                                                             | Attendance, classroom participation, small group interactions.                                                                                   |          |          |          |          |
| CO4                                                                                             | Research and write about relevant topics.                                                                                                        |          |          |          |          |
| CO5                                                                                             | Design and complete a research project that can take the form of a development interview, an observation or assessment through service learning. |          |          |          |          |

|                                                                                                                             |          |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|----------------------------------------------|---|---|---|---|
| CO6                                                                                                                         |          | Develop and maintain a Reflection                              |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| 1                                                                                                                           | COs/POs  | a                                                              | b                           | c                  | d                      | e                  | f                       | g                  | h                                            | I | J | k | l |
| 2                                                                                                                           | CO1      | L                                                              |                             | H                  |                        |                    |                         | M                  |                                              |   |   |   |   |
|                                                                                                                             | CO2      |                                                                | H                           | H                  |                        |                    |                         | M                  |                                              |   |   |   |   |
|                                                                                                                             | CO3      |                                                                |                             |                    |                        |                    |                         | M                  | H                                            |   |   |   |   |
|                                                                                                                             | CO4      |                                                                |                             |                    |                        |                    |                         |                    |                                              | H | H |   |   |
|                                                                                                                             | CO5      |                                                                |                             |                    |                        |                    |                         | M                  |                                              |   | H | H |   |
|                                                                                                                             | CO6      |                                                                |                             |                    |                        |                    |                         | M                  |                                              |   |   |   | L |
| 3                                                                                                                           | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |   |   |   |
|                                                                                                                             |          | √                                                              |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| 4                                                                                                                           | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |

## **UNIT I INTRODUCTION TO PERSONALITY DEVELOPMENT 6**

The concept personality- Dimensions of theories of Freud & Erickson- personality – significant of personality development. The concept of success and failure: What is success? - Hurdles in achieving success - Overcoming hurdles - Factors responsible for success – What is failure - Causes of failure. SWOT analyses.

## **UNIT II ATTITUDE & MOTIVATION 6**

Attitude - Concept - Significance - Factors affecting attitudes - Positive attitude - Advantages – Negative attitude - Disadvantages - Ways to develop positive attitude - Difference between personalities having positive and negative attitude. Concept of motivation - Significance - Internal and external motives - Importance of self-motivation- Factors leading to de-motivation

## **UNIT III SELF-ESTEEM 6**

Term self-esteem - Symptoms - Advantages - Do's and Don'ts to develop positive self-esteem – Low self-esteem - Symptoms - Personality having low self esteem - Positive and negative self-esteem. Interpersonal Relationships – Defining the difference between aggressive, submissive and assertive behaviours - Lateral thinking.

## **UNIT IV OTHER ASPECTS OF PERSONALITY DEVELOPMENT 6**

Body language - Problem-solving - Conflict and Stress Management - Decision-making skills - Leadership and qualities of a successful leader - Character-building -Team-work - Time management -Work ethics –Good manners and etiquette.

## **UNIT V EMPLOYABILITY QUOTIENT 6**

Resume building- The art of participating in Group Discussion – Acing the Personal (HR & Technical) Interview -Frequently Asked Questions - Psychometric Analysis - Mock Interview Sessions.

**TEXT BOOKS:**

1. Hurlock, E.B (2006). Personality Development, 28<sup>th</sup> Reprint. New Delhi: Tata McGraw Hill.
2. Stephen P. Robbins and Timothy A. Judge (2014), Organizational Behavior 16<sup>th</sup> Edition, Prentice Hall.

**REFERENCE BOOKS:**

1. Andrews, Sudhir. How to Succeed at Interviews. 21st (rep.) New Delhi. Tata McGraw-Hill 1988.
2. Heller, Robert. Effective leadership. Essential Manager series. Dk Publishing, 2002
3. Hindle, Tim. Reducing Stress. Essential Manager series. Dk Publishing, 2003
4. Lucas, Stephen. Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill. 2001
5. Mile, D.J Power of positive thinking. Delhi. Rohan Book Company, (2004).
6. Pravesh Kumar. All about Self- Motivation. New Delhi. Goodwill Publishing House. 2005.
7. Smith, B . Body Language. Delhi: Rohan Book Company. 2004

|                                                                                                                             |                                                                                                                                                          |   |   |   |   |   |   |   |          |          |          |          |   |
|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|---|---|----------|----------|----------|----------|---|
| <b>BBT102</b>                                                                                                               | <b>BIOLOGY FOR ENGINEERS</b>                                                                                                                             |   |   |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |
|                                                                                                                             | Total Contact Hours – 30                                                                                                                                 |   |   |   |   |   |   |   | 2        | 0        | 0        | 2        |   |
|                                                                                                                             | Prerequisite – Basic Science                                                                                                                             |   |   |   |   |   |   |   |          |          |          |          |   |
|                                                                                                                             | Course Designed by – Department of Industrial Bio Technology                                                                                             |   |   |   |   |   |   |   |          |          |          |          |   |
| <b>OBJECTIVES</b>                                                                                                           |                                                                                                                                                          |   |   |   |   |   |   |   |          |          |          |          |   |
| Gain vivid knowledge in the fundamentals and uses of biology, human system and plant system.                                |                                                                                                                                                          |   |   |   |   |   |   |   |          |          |          |          |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                |                                                                                                                                                          |   |   |   |   |   |   |   |          |          |          |          |   |
| CO1                                                                                                                         | Graduates within the first five years will be able to grasp and apply biological engineering principles, procedures needed to solve real-world problems. |   |   |   |   |   |   |   |          |          |          |          |   |
| CO2                                                                                                                         | To understand the fundamentals of living things, their classification, cell structure and biochemical constituents                                       |   |   |   |   |   |   |   |          |          |          |          |   |
| CO3                                                                                                                         | To apply the concept of plant, animal and microbial systems and growth in real life situations                                                           |   |   |   |   |   |   |   |          |          |          |          |   |
| CO4                                                                                                                         | To comprehend genetics and the immune system                                                                                                             |   |   |   |   |   |   |   |          |          |          |          |   |
| CO5                                                                                                                         | To know the cause, symptoms, diagnosis and treatment of common diseases                                                                                  |   |   |   |   |   |   |   |          |          |          |          |   |
| CO6                                                                                                                         | To give a basic knowledge of the applications of biological systems in relevant industries                                                               |   |   |   |   |   |   |   |          |          |          |          |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                                                                          |   |   |   |   |   |   |   |          |          |          |          |   |
| 1                                                                                                                           | COs/POs                                                                                                                                                  | a | b | c | d | e | f | g | h        | I        | j        | k        | l |
| 2                                                                                                                           | CO1                                                                                                                                                      | H |   |   |   |   |   | M |          |          |          |          |   |
|                                                                                                                             | CO2                                                                                                                                                      |   | H |   |   |   |   |   |          | H        |          |          |   |
|                                                                                                                             | CO3                                                                                                                                                      |   |   | H |   |   |   |   |          |          | M        |          |   |
|                                                                                                                             | CO4                                                                                                                                                      |   |   |   |   |   |   |   |          |          | H        |          |   |
|                                                                                                                             | CO5                                                                                                                                                      |   |   |   |   |   |   |   |          |          |          |          |   |
|                                                                                                                             | CO6                                                                                                                                                      |   |   |   |   |   | H |   |          |          |          |          | M |

|   |          |                                                                |                        |                    |                        |                    |                         |                    |                                               |
|---|----------|----------------------------------------------------------------|------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|-----------------------------------------------|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Thesis Paper/Seminar/ Internship (PR) |
|   |          |                                                                | √                      |                    |                        |                    |                         |                    |                                               |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                        |                    |                        |                    |                         |                    |                                               |

### UNIT I INTRODUCTION TO LIFE

6

Characteristics of living organisms-Basic classification-cell theory-structure of prokaryotic and eukaryotic cell-Introduction to biomolecules: definition-general classification and important functions of carbohydrates-lipids-proteins-nucleic acids vitamins and enzymes-genes and chromosome.

### UNIT II BIODIVERSITY

6

Plant System: basic concepts of plant growth-nutrition-photosynthesis and nitrogen fixation-Animal System: elementary study of digestive-respiratory-circulatory-excretory systems and their functions-Microbial System: history-types of microbes-economic importance and control of microbes.

### UNIT III GENETICS AND IMMUNE SYSTEM

6

Evolution: theories of evolution-Mendel's cell division-mitosis and meiosis-evidence of laws of inheritance-variation and speciation- nucleic acids as a genetic material-central dogma immunity-antigens-antibody-immune response.

### UNIT IV HUMAN DISEASES

6

Definition- causes, symptoms, diagnosis, treatment and prevention of diabetes, cancer, hypertension, influenza, AIDS and Hepatitis

### UNIT V BIOLOGY AND ITS INDUSTRIAL APPLICATION

6

Transgenic plants and animals-stem cell and tissue engineering-bioreactors-biopharming-recombinant vaccines-cloning-drug discovery-biological neural networks-bioremediation-biofertilizer-biocontrol-biofilters-biosensors-biopolymers-bioenergy-biomaterials-biochips-basic biomedical instrumentation.

### TEXT BOOKS:

1. A Text book of Biotechnology, R.C.Dubey, S. Chand Higher Academic Publications, 2013
2. Diseases of the Human Body, Carol D. Tamparo and Marcia A. Lewis, F.A. Davis Company, 2011.
3. Biomedical instrumentation, Technology and applications, R. Khandpur, McGraw Hill Professional, 2004

### REFERENCE BOOKS

1. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
2. Cell Biology and Genetics (Biology: The unity and diversity of life Volume I), Cecie Starr, Ralph Taggart, Christine Evers and Lisa Starr, Cengage Learning, 2008
3. Biotechnology Expanding horizon, B.D. Singh, Kalyani Publishers, 2012

|                                                                                                                             |                                                                                                      |                                                                |                             |                    |   |                        |                    |   |                         |   |                    |                                              |          |          |
|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|--------------------|---|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|----------|----------|
| <b>BME 101</b>                                                                                                              | <b>ENGINEERING GRAPHICS- E</b>                                                                       |                                                                |                             |                    |   |                        |                    |   |                         |   | <b>L</b>           | <b>T</b>                                     | <b>P</b> | <b>C</b> |
|                                                                                                                             | Total Contact Hours - 60                                                                             |                                                                |                             |                    |   |                        |                    |   |                         |   | 2                  | 0                                            | 3        | 4        |
|                                                                                                                             | Prerequisite – +2 Level Maths & Physical Science                                                     |                                                                |                             |                    |   |                        |                    |   |                         |   |                    |                                              |          |          |
|                                                                                                                             | Course Designed by – Department of Mechanical Engineering                                            |                                                                |                             |                    |   |                        |                    |   |                         |   |                    |                                              |          |          |
| <b>OBJECTIVES</b>                                                                                                           |                                                                                                      |                                                                |                             |                    |   |                        |                    |   |                         |   |                    |                                              |          |          |
| <b>To understand techniques of drawings in various fields of engineering</b>                                                |                                                                                                      |                                                                |                             |                    |   |                        |                    |   |                         |   |                    |                                              |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                |                                                                                                      |                                                                |                             |                    |   |                        |                    |   |                         |   |                    |                                              |          |          |
| CO1                                                                                                                         | To know about different types of lines & use of different types of pencils in an Engineering Drawing |                                                                |                             |                    |   |                        |                    |   |                         |   |                    |                                              |          |          |
| CO2                                                                                                                         | To know how to represents letters & numbers in drawing sheet                                         |                                                                |                             |                    |   |                        |                    |   |                         |   |                    |                                              |          |          |
| CO3                                                                                                                         | To know about different types of projection                                                          |                                                                |                             |                    |   |                        |                    |   |                         |   |                    |                                              |          |          |
| CO4                                                                                                                         | To know projection of points ,straight lines, solids etc.                                            |                                                                |                             |                    |   |                        |                    |   |                         |   |                    |                                              |          |          |
| CO5                                                                                                                         | To know development of different types of surfaces.                                                  |                                                                |                             |                    |   |                        |                    |   |                         |   |                    |                                              |          |          |
| CO6                                                                                                                         | To know about isometric projection.                                                                  |                                                                |                             |                    |   |                        |                    |   |                         |   |                    |                                              |          |          |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                      |                                                                |                             |                    |   |                        |                    |   |                         |   |                    |                                              |          |          |
| 1                                                                                                                           | COs/POs                                                                                              | a                                                              | b                           | C                  | d | e                      | f                  | g | h                       | i | J                  | k                                            | l        |          |
| 2                                                                                                                           | CO1                                                                                                  | H                                                              |                             |                    |   |                        |                    |   |                         |   |                    |                                              | H        |          |
|                                                                                                                             | CO2                                                                                                  | M                                                              | H                           |                    |   |                        |                    |   |                         |   |                    |                                              | M        |          |
|                                                                                                                             | CO3                                                                                                  |                                                                |                             | L                  |   |                        |                    |   |                         |   |                    |                                              | M        |          |
|                                                                                                                             | CO4                                                                                                  |                                                                |                             |                    |   |                        | L                  |   | H                       | H |                    |                                              | L        |          |
|                                                                                                                             | CO5                                                                                                  |                                                                |                             | L                  |   |                        |                    |   |                         | H |                    |                                              | L        |          |
|                                                                                                                             | CO6                                                                                                  |                                                                |                             | L                  |   |                        |                    |   |                         |   | H                  |                                              | L        |          |
| 3                                                                                                                           | Category                                                                                             | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) |   | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |          |          |
|                                                                                                                             |                                                                                                      |                                                                |                             | √                  |   |                        |                    |   |                         |   |                    |                                              |          |          |
| 4                                                                                                                           | Approval                                                                                             | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |   |                        |                    |   |                         |   |                    |                                              |          |          |

## UNIT I BASIC CURVES, PROJECTION OF POINTS AND STRAIGHT LINES 6+6

Conics-construction of ellipse, parabola and hyperbola by eccentricity method-construction of cycloids- construction of involutes of square and circle-Drawing of tangent and normal to the above curves-Scales-Basic drawing conventions and standards-Orthographic projection principles- Principal planes-First angle projection- Projection of points. Projection of straight lines (only first angle projections) inclined to both the principal planes- Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces.

**6+6**

## **UNIT II PROJECTIONS OF PLANES AND SOLIDS**

Projection of planes (Polygonal and circular surfaces) inclined to both the principal planes. Projection of simple solids like prisms, pyramids, cylinder, cone, tetrahedron and truncated solids when the axis is inclined to one of the principal planes/ both principal planes by rotating object method and auxiliary plane method.

## **UNIT III ORTHOGRAPHIC PROJECTIONS, ISOMETRIC PROJECTIONS & FREEHANDSKETCHING 6+6**

Orthographic projection of Simple parts from 3D diagram-Principles of isometric projection and isometric view-isometric scale- Isometric projections of simple solids and truncated solids- Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems Free hand sketching of orthographic & Isometric projection

## **UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6+6**

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other-obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids- Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

## **UNIT V PERSPECTIVE PROJECTION, BUILDING DRAWING AND COMPUTER AIDED DRAFTING 6+6**

Perspective projection of simple solids-Prisms, Pyramids and cylinders by visual ray method. Introduction- components of simple residential or office building-specifications-plan and elevation of different types of Residential buildings and office buildings. Introduction to drafting packages and basic commands used in AUTO CAD. Demonstration of drafting packages.

### **TEXT BOOKS:**

1. N.D.Bhatt and V.M.Panchal, "Engineering Drawing", Charotar Publishing House, 50<sup>th</sup> Edition, 2010.
2. K.V.Natarajan "A Text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.

### **REFERENCES:**

1. K.R.Gopalakrishna, "Engineering drawing", (Vol-I & II combined) Subhas stores, Bangalore, 2007.
2. K.Venugopal and V. Prabhu Raja, "Engineering Graphics", New Age International Private limited, 2008.
3. Luzzader, Warren.J., and Duff, John.M., "Fundamentals of Engineering Drawing with an introduction to Interactive computer graphics for design and production", Eastern Economy Edition, Prentice Hall of India Pvt Ltd, New Delhi, 2005.

### **Special points applicable to University Examinations on Engineering Graphics**

- 1) There will be five questions, each of either or type covering all units of the syllabus.
- 2) All questions will carry equal marks of 20 each making a total of 100.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                      |          |          |          |          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------|----------|----------|----------|
| <b>BME103</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>BASIC MECHANICAL ENGINEERING</b>                                                  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Total Contact Hours – 30                                                             | 2        | 0        | 0        | 2        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Prerequisite – +2 Level Maths & Physical Science                                     |          |          |          |          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Course Designed by – Dept of Mechanical Engineering                                  |          |          |          |          |
| <b>OBJECTIVES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                      |          |          |          |          |
| <ul style="list-style-type: none"><li>• The program educational objectives (PEOs) for the mechanical-engineering program are to educate graduates who will be ethical, productive, and contributing members of society.</li><li>• The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context</li><li>• The ability to apply principles of engineering, basic science, and mathematics to design and realize physical systems, components, or processes</li></ul> |                                                                                      |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                      |          |          |          |          |
| CO1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | an ability to apply knowledge of mathematics                                         |          |          |          |          |
| CO2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | an ability to apply knowledge of science, and engineering                            |          |          |          |          |
| CO3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Ability to design and conduct experiments, as well as to analyze and interpret data. |          |          |          |          |
| CO4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | an ability to function on multi-disciplinary teams                                   |          |          |          |          |
| CO5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | To provide basic Knowledge of basic manufacturing process.                           |          |          |          |          |
| CO6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ability to identify, formulate, and solve engineering problems                       |          |          |          |          |

#### **UNIT I ENERGY RESOURCES AND POWER GENERATION 6**

Renewable and Non-renewable resources-

solar, wind, geothermal, steam, nuclear and hydro power plants-Layout, major components and working. Importance of Energy storage, Environmental constraints of power generation using fossil fuels and nuclear energy.

#### **UNIT II IC ENGINES 6**

Classification, working principles of petrol and diesel engines-two stroke and four stroke cycles, functions of main components of I.C. Engine. Alternate fuels and emission control.

#### **UNIT III REFRIGERATION AND AIR-CONDITIONING SYSTEM 6**

Terminology of Refrigeration and Air-Conditioning, Principle of Vapor Compression & Absorption system- Layout of typical domestic refrigerator-window & Split type room air conditioner.

#### **UNIT IV MANUFACTURING PROCESSES 6**

Brief description of Moulding and casting process, Metal forming, Classification types of forging, forging operations, Brief description of extrusion, rolling, sheet forging, and drawing. Brief description of welding, brazing and soldering. Principal metal cutting processes and cutting tools, Brief description of Centre lathe and radial drilling machine.

#### **UNIT V MECHANICAL DESIGN 6**

Mechanical properties of material-Yield strength, ultimate strength, endurance limit etc., Stress-Strain curves of materials. Stresses induced in simple elements. Factor of safety-Design of Shafts and belts. Types of bearings and its applications. Introduction to CAD/CAM/CIM & Mechatronics.

**TEXTBOOKS:**

1. T.J.Prabhu et al, "Basic Mechanical Engineering", SciTech Publications (p) Ltd, 2000

**REFERENCES:**

1. NAGPAL, G.R, "Power plant Engineering", Khanna Publishers, 2004.
2. RAO. P.N, "Manufacturing Technology", Tata McGraw-Hill Education, 2000.
3. Kalpakjian, "Manufacturing Engineering and Technology", Addison Wesley Publishers, 1995.
4. Ganesan. V, "Internal combustion Engines", Tata McGraw-Hill Education, 2000.
5. C.P. Arora, "Refrigeration and Air Conditioning", Tata McGraw-Hill Education, 2001.
6. V.B. Bhandari, "Design of Machine elements", Tata McGraw-Hill Education, 2010.

|               |                                                                               |          |          |          |          |
|---------------|-------------------------------------------------------------------------------|----------|----------|----------|----------|
| <b>BCM1L1</b> | <b>BASIC CIVIL &amp; MECHANICAL ENGINEERING PRACTICES LABORATORY</b>          | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|               | Total Contact Hours - 30                                                      | 0        | 0        | 2        | 1        |
|               | Prerequisite – Basic Civil and Mechanical Engineering                         |          |          |          |          |
|               | Course Designed by – Department of Mechanical Engineering & Civil Engineering |          |          |          |          |

**OBJECTIVES**

To provide exposure to the students with hands on experience on various basic Civil & Mechanical Engineering practices.

**COURSE OUTCOMES (COs)**

|     |                                                                                                                                                 |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | Learn Basic concepts                                                                                                                            |
| CO2 | Students will get exposure regarding pipe connection for pumps & turbines and to study the joint used in roofs, doors, windows and furniture's. |
| CO3 | Students will get exposure regarding smithy, foundry operations and in latest welding operations such as TIG, MIG, CO2, spot welding etc.,      |
| CO4 | Students will get hands on experience on basic welding techniques, machining and sheet metal works.                                             |
| CO5 | Students will get hands on experience on basic machining techniques                                                                             |
| CO6 | Students will get hands on experience on basic sheet metal techniques                                                                           |

| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                  |   |                        |   |                    |   |                        |   |                    |   |                         |   |
|-----------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------|---|------------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|
| 1                                                                                                                           | COs/POs  | a                                | b | c                      | d | e                  | f | g                      | h | i                  | J | k                       | l |
| 2                                                                                                                           | CO1      | H                                | L |                        |   |                    |   |                        |   |                    |   |                         |   |
|                                                                                                                             | CO2      |                                  |   |                        | H |                    |   |                        |   |                    |   |                         |   |
|                                                                                                                             | CO3      |                                  |   |                        |   | H                  | L | L                      |   |                    |   |                         |   |
|                                                                                                                             | CO4      |                                  | H |                        |   |                    | M |                        | L |                    |   | H                       |   |
|                                                                                                                             | CO5      |                                  | H |                        |   |                    | M |                        | L |                    |   | H                       |   |
|                                                                                                                             | CO6      |                                  | H |                        |   |                    | M |                        | L |                    |   | H                       |   |
| 3                                                                                                                           | Category | Humanities & Social Studies (HS) |   | Basic Sciences & Maths |   | Engg Sciences (ES) |   | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   |
|                                                                                                                             |          |                                  |   |                        |   | √                  |   |                        |   |                    |   |                         |   |
|                                                                                                                             |          |                                  |   |                        |   |                    |   |                        |   |                    |   |                         |   |
|                                                                                                                             |          |                                  |   |                        |   |                    |   |                        |   |                    |   |                         |   |
|                                                                                                                             |          |                                  |   |                        |   |                    |   |                        |   |                    |   |                         |   |
|                                                                                                                             |          |                                  |   |                        |   |                    |   |                        |   |                    |   |                         |   |
|                                                                                                                             |          |                                  |   |                        |   |                    |   |                        |   |                    |   |                         |   |
|                                                                                                                             |          |                                  |   |                        |   |                    |   |                        |   |                    |   |                         |   |

|   |          |                                                                |
|---|----------|----------------------------------------------------------------|
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |
|---|----------|----------------------------------------------------------------|

## LIST OF EXPERIMENTS

### I. CIVIL ENGINEERING PRACTICE

#### Buildings:

- Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

#### Plumbing Works:

- Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in house hold fittings.
- Study of pipe connections requirements for pumps and turbines.
- Preparation of plumbing lines sketches for water supply and sewage works.
- Hands-on-exercise: Basic pipe connection of PVC pipes & G.I. Pipes–Mixed pipe material connection – Pipe connections with different joining components.
- Demonstration of plumbing requirements of high-rise buildings.

#### Carpentry using Hand tools and Power tools:

- Study of the joints in roofs, doors, windows and furniture.
- Hands-on-exercise: Wood work, joints by sawing, planing and cutting.
- Preparation of half joints, Mortise and Tenon joints.

### II MECHANICAL ENGINEERING PRACTICE

#### Welding:

- Preparation of butt joints, lap joints and tee joints by arc welding

#### Basic Machining:

- Simple Turning and Taper turning
- Drilling Practice

#### Sheet Metal Work:

- Forming & Bending:
- Model making–Trays, funnels, etc.
- Different type of joints
- Preparation of air-conditioning ducts
- Preparation of butt joints, lap joints and tee joints by arc welding

#### Machine assembly practice:

- Assembling, dismantling and Study of centrifugal pump
- Assembling, dismantling and Study of air conditioner
- Assembling, dismantling and Study of lathe

#### Moulding:

- Moulding operations like mould preparation for gear and step cone pulley etc

#### Fitting:

- Fitting Exercises–Preparation of square fitting and vee–fitting models.

#### Demonstration:

- Smithy operations, upsetting, swaging, setting down and bending. Example–Exercise–Production of hexagonal headed bolt.
- Gas welding.

### REFERENCES:

1. K. Jeyachandran, S. Nararajan & S. Balasubramanian, "A Primer on Engineering Practices Laboratory", Anuradha Publications, (2007).
2. T. Jeyapooan, M. Saravanapandian & S. Pranitha, "Engineering Practices Lab Manual", Vikas Publishing House Pvt. Ltd. (2006)
3. H. S. Bawa, "Workshop Practice", Tata McGraw-Hill Publishing Company Limited, (2007).
4. A. Rajendra Prasad & P. M. M. S. Sarma, "Workshop Practice", Sree Sai Publication, (2002).
5. P. Kannaiah & K. L. Narayana, "Manual on Workshop Practice", Scitech Publication, (1999).

|                                                                                                                             |                                                                      |                                                                |                              |   |                          |   |                           |                          |                               |                          |                                                          |          |          |          |
|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------|------------------------------|---|--------------------------|---|---------------------------|--------------------------|-------------------------------|--------------------------|----------------------------------------------------------|----------|----------|----------|
| <b>BPC<br/>1L1/2L1</b>                                                                                                      | <b>PHYSICS AND CHEMISTRY LABORATORY</b>                              |                                                                |                              |   |                          |   |                           |                          |                               |                          | <b>L</b>                                                 | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                                             | Total Contact Hours – 45                                             |                                                                |                              |   |                          |   |                           |                          |                               |                          | 0                                                        | 0        | 3        | 1        |
|                                                                                                                             | Prerequisite – Physics and Chemistry                                 |                                                                |                              |   |                          |   |                           |                          |                               |                          |                                                          |          |          |          |
|                                                                                                                             | Course Designed by – Department of Physics & Chemistry               |                                                                |                              |   |                          |   |                           |                          |                               |                          |                                                          |          |          |          |
| <b>OBJECTIVES:</b> To impart knowledge to the students in practical physics and chemistry                                   |                                                                      |                                                                |                              |   |                          |   |                           |                          |                               |                          |                                                          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                |                                                                      |                                                                |                              |   |                          |   |                           |                          |                               |                          |                                                          |          |          |          |
| CO1                                                                                                                         | Students will understand the concept of hall effect                  |                                                                |                              |   |                          |   |                           |                          |                               |                          |                                                          |          |          |          |
| CO2                                                                                                                         | Students will understand the concept of semiconductors. .            |                                                                |                              |   |                          |   |                           |                          |                               |                          |                                                          |          |          |          |
| CO3                                                                                                                         | Student will understand the working of spectrometer.                 |                                                                |                              |   |                          |   |                           |                          |                               |                          |                                                          |          |          |          |
| CO4                                                                                                                         | Student will able practically understand the chemical reactions.     |                                                                |                              |   |                          |   |                           |                          |                               |                          |                                                          |          |          |          |
| CO5                                                                                                                         | Students will Study the magnetic hysteresis and energy product       |                                                                |                              |   |                          |   |                           |                          |                               |                          |                                                          |          |          |          |
| CO6                                                                                                                         | Students understand the Determination of Band gap of a semiconductor |                                                                |                              |   |                          |   |                           |                          |                               |                          |                                                          |          |          |          |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                      |                                                                |                              |   |                          |   |                           |                          |                               |                          |                                                          |          |          |          |
| 1                                                                                                                           | COs/POs                                                              | a                                                              | b                            | c | d                        | e | f                         | g                        | h                             | i                        | j                                                        | k        | l        |          |
| 2                                                                                                                           | CO1                                                                  | M                                                              | H                            | M |                          |   | L                         |                          | L                             | L                        | M                                                        | H        | M        |          |
|                                                                                                                             | CO2                                                                  |                                                                | H                            | M |                          |   | L                         |                          | L                             | L                        |                                                          | H        |          |          |
|                                                                                                                             | CO3                                                                  |                                                                | H                            | M |                          |   | L                         |                          | L                             |                          |                                                          | H        |          |          |
|                                                                                                                             | CO4                                                                  | M                                                              | H                            | M |                          |   | L                         |                          | L                             | L                        | M                                                        | H        | M        |          |
|                                                                                                                             | CO6                                                                  |                                                                | H                            |   |                          |   | L                         |                          | L                             | H                        |                                                          | H        |          |          |
| 3                                                                                                                           | Category                                                             | Humanities<br>& Social<br>Studies (HS)                         | Basic<br>Sciences<br>& Maths |   | Engg<br>Sciences<br>(ES) |   | Professional<br>Core (PC) | Core<br>Elective<br>(CE) | Non-Major<br>Elective<br>(NE) | Open<br>Elective<br>(OE) | Project/Term<br>Paper/<br>Seminar/<br>Internship<br>(PR) |          |          |          |
|                                                                                                                             |                                                                      |                                                                | √                            |   |                          |   |                           |                          |                               |                          |                                                          |          |          |          |
| 4                                                                                                                           | Approval                                                             | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                              |   |                          |   |                           |                          |                               |                          |                                                          |          |          |          |

#### **I -LIST OF EXPERIMENTS – PHYSICS**

1. Determination of Wavelength, and particle size using Laser
2. Determination of acceptance angle in an optical fiber.
3. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.

4. Determination of wavelength of mercury spectrum – spectrometer grating
5. Determination of thermal conductivity of a bad conductor – Lee’s Disc method.
6. Determination of Young’s modulus by Non uniform bending method
7. Determination of specific resistance of a given coil of wire – Carey Foster’s Bridge
8. Determination of Young’s modulus by uniform bending method
9. Determination of band gap of a semiconductor
10. Determination of Coefficient of viscosity of a liquid –Poiseuille’s method
11. Determination of Dispersive power of a prism - Spectrometer
12. Determination of thickness of a thin wire – Air wedge method
13. Determination of Rigidity modulus – Torsion pendulum

## II- LIST OF EXPERIMENTS – CHEMISTRY

1. Estimation of hardness of Water by EDTA
2. Estimation of Copper in brass by EDTA
3. Determination of DO in water (Winkler’s method)
4. Estimation of Chloride in Water sample (Argentometry)
5. Estimation of alkalinity of Water sample
6. Determination of molecular weight
7. Conduct metric titration (Simple acid base)
8. Conduct metric titration (Mixture of weak and strong acids)
9. Conduct metric titration using  $\text{BaCl}_2$  vs  $\text{Na}_2\text{SO}_4$
10. Potentiometric Titration ( $\text{Fe}^{2+}$  /  $\text{KMnO}_4$  or  $\text{K}_2\text{Cr}_2\text{O}_7$ )
11. pH titration (acid & base)
12. Determination of water of crystallization of a crystalline salt (Copper Sulphate)
13. Estimation of Ferric iron by spectrophotometer.

|                                                                                                                                                  |                                                                                                                                              |   |   |   |   |
|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|
| BEN 201                                                                                                                                          | ENGLISH II                                                                                                                                   | L | T | P | C |
|                                                                                                                                                  | Total Contact Hours – 60                                                                                                                     | 3 | 1 | 0 | 3 |
|                                                                                                                                                  | Prerequisite – English I                                                                                                                     |   |   |   |   |
|                                                                                                                                                  | Course Designed by – Department of English                                                                                                   |   |   |   |   |
| OBJECTIVES                                                                                                                                       |                                                                                                                                              |   |   |   |   |
| Students will be able to actively participate in group discussions. Students will have Teleph Skills, Giving Directions and Information Transfer |                                                                                                                                              |   |   |   |   |
| COURSE OUTCOMES (COs)                                                                                                                            |                                                                                                                                              |   |   |   |   |
| CO1                                                                                                                                              | To make the students aware to different kinds of Learner-friendly modes of language variety of self- instructional learning (Computer based) |   |   |   |   |
| CO2                                                                                                                                              | To make students comprehend the habit of intelligent Reading as well as Computer based competitive exams glob                                |   |   |   |   |
| CO3                                                                                                                                              | To achieve a reasonably good level of competency in Report Writing.                                                                          |   |   |   |   |
| CO4                                                                                                                                              | To make the students aware to different kinds of Learner-friendly modes of language variety of self- instructional learning (Computer based) |   |   |   |   |
| CO5                                                                                                                                              | To achieve a reasonably good level of competency in group discussions                                                                        |   |   |   |   |

|                                                                                                                             |          |                                                                     |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|-----------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------|---|-----------------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|----------------------------------------------|--|
| CO6                                                                                                                         |          | To achieve a reasonably good level of competency in public speaking |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                     |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| 1                                                                                                                           | COs/POs  | a                                                                   | b | c                           | d | e                  | f | g                      | h | i                  | J | k                       | l |                    |  |                                              |  |
| 2                                                                                                                           | CO1      | M                                                                   | L | H                           | L | M                  |   |                        | H |                    | M | L                       |   |                    |  |                                              |  |
|                                                                                                                             | CO2      |                                                                     |   | H                           | L |                    |   |                        | H |                    | M | L                       |   |                    |  |                                              |  |
|                                                                                                                             | CO3      |                                                                     |   | H                           | L | M                  |   |                        | H |                    | H | L                       |   |                    |  |                                              |  |
|                                                                                                                             | CO4      |                                                                     |   | H                           | L | M                  |   |                        | H |                    | M | L                       |   |                    |  |                                              |  |
|                                                                                                                             | CO5      |                                                                     |   | H                           | L | M                  |   |                        | H |                    | M | L                       |   |                    |  |                                              |  |
|                                                                                                                             | CO6      |                                                                     |   | H                           | L | M                  |   |                        | H |                    | M | L                       |   |                    |  |                                              |  |
| 3                                                                                                                           | Category | Humanities & Social Studies (HS)                                    |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) |   | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) |  | Project/Term Paper/ Seminar/ Internship (PR) |  |
|                                                                                                                             |          | √                                                                   |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| 4                                                                                                                           | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016      |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |

## UNIT I ORIENTATION

12

Numerical adjectives - Meanings in context - Same words used as different parts of speech - Paragraph writing - Non- verbal communication - Regular and Irregular verbs.

## UNIT II ORAL SKILL

12

Listening to audio cassettes - C.Ds , News bulletin - Special Lectures, Discourse - Note taking - Sentence patterns - SV, SVO, SVC, SVOC, SVOCA - and Giving Instructions - Reading Comprehension answering questions. Inferring meaning.

## UNIT III THINKING SKILL

12

Self- introduction describing –Group Discussion – Debate –Role play- Telephone- Things-etiquette- Recommendation and Sequencing jumbled sentences to make a suggestions-paragraph-advertisement and notice, Designing or drafting posters, writing formal and informal invitations and replies.

## UNIT IV WRITING SKILL

12

Definitions - Compound nouns - Abbreviations and acronyms – (a) business or official letters(for making enquiries, registering complaints, asking for and giving information, placing orders and sending replies): (b) Letters to the editor (giving suggestions on an issue) .

## UNIT V FORMAL INFORMATION

12

Editing – Prepositions - Articles - Permission letter for undergoing practical training , Essay writing - Application for a job , letter to the principal authorities regarding admissions, other issues, requirement or suitability of course etc.

## TEXT BOOK:

1. Meenakshi Raman, Sangeetha Sharma , Technical English for Communication: Principle and Practice, OUP, 2009.

**REFERENCE BOOKS:**

1. Sumanth , English for Engineers, Vijay Nicole , Imprints Pvt Ltd.2013.
2. Meenakshi Raman and SangeethaSharma , Technical Communication Principles and Practice, Oxford University Press, 2009.
3. Sangeetha Sharma, Binodmishra , Communication skills for engineers and scientists , PHI Learning Pvt Ltd, New Delhi, 2010.

|                                                                                                                             |                                                                                                                                                      |                                                                |                             |   |               |                        |   |                    |   |                         |   |                    |   |                                               |
|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|---|---------------|------------------------|---|--------------------|---|-------------------------|---|--------------------|---|-----------------------------------------------|
| BMA 201                                                                                                                     | MATHEMATICS – II                                                                                                                                     |                                                                |                             |   |               |                        |   |                    |   |                         | L | T                  | P | C                                             |
|                                                                                                                             | Total Contact Hours - 60                                                                                                                             |                                                                |                             |   |               |                        |   |                    |   |                         | 3 | 1                  | 0 | 3                                             |
|                                                                                                                             | Prerequisite – Mathematics I                                                                                                                         |                                                                |                             |   |               |                        |   |                    |   |                         |   |                    |   |                                               |
|                                                                                                                             | Course Designed by – Department of Mathematics                                                                                                       |                                                                |                             |   |               |                        |   |                    |   |                         |   |                    |   |                                               |
| OBJECTIVES                                                                                                                  |                                                                                                                                                      |                                                                |                             |   |               |                        |   |                    |   |                         |   |                    |   |                                               |
| Ability to apply these principles of mathematics in projects and research works.                                            |                                                                                                                                                      |                                                                |                             |   |               |                        |   |                    |   |                         |   |                    |   |                                               |
| COURSE OUTCOMES (COs)                                                                                                       |                                                                                                                                                      |                                                                |                             |   |               |                        |   |                    |   |                         |   |                    |   |                                               |
| CO1                                                                                                                         | Student shall be able to Solve differential equations, simultaneous linear equations, some special types of linear equations related to engineering. |                                                                |                             |   |               |                        |   |                    |   |                         |   |                    |   |                                               |
| CO2                                                                                                                         | Relate the use of mathematics in applications of various fields namely fluid flow, heat fl solid mechanics, electrostatics, etc.                     |                                                                |                             |   |               |                        |   |                    |   |                         |   |                    |   |                                               |
| CO3                                                                                                                         | Ability to test hypothesis                                                                                                                           |                                                                |                             |   |               |                        |   |                    |   |                         |   |                    |   |                                               |
| CO4                                                                                                                         | Find intensity of degree of relationship between two variables and also bring out regres equations.                                                  |                                                                |                             |   |               |                        |   |                    |   |                         |   |                    |   |                                               |
| CO5                                                                                                                         | Understand to solve matrix problems related to real life problems.                                                                                   |                                                                |                             |   |               |                        |   |                    |   |                         |   |                    |   |                                               |
| CO6                                                                                                                         | Formulate mathematical models                                                                                                                        |                                                                |                             |   |               |                        |   |                    |   |                         |   |                    |   |                                               |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                                                                      |                                                                |                             |   |               |                        |   |                    |   |                         |   |                    |   |                                               |
| 1                                                                                                                           | COs/POs                                                                                                                                              | a                                                              | b                           | c | d             | e                      | f | g                  | h | i                       | j | k                  | l |                                               |
| 2                                                                                                                           | CO1                                                                                                                                                  | H                                                              |                             | L |               |                        |   |                    |   |                         |   |                    |   |                                               |
|                                                                                                                             | CO2                                                                                                                                                  |                                                                | H                           |   |               |                        | H |                    | L | L                       |   | M                  |   |                                               |
|                                                                                                                             | CO3                                                                                                                                                  |                                                                | H                           |   |               |                        | H |                    | L | L                       |   | M                  |   |                                               |
|                                                                                                                             | CO4                                                                                                                                                  |                                                                |                             |   |               | M                      |   |                    |   |                         |   | M                  |   |                                               |
|                                                                                                                             | CO5                                                                                                                                                  |                                                                |                             |   |               |                        |   |                    |   |                         | M | M                  |   |                                               |
|                                                                                                                             | CO6                                                                                                                                                  |                                                                |                             |   |               |                        |   |                    |   |                         | M |                    |   |                                               |
| 3                                                                                                                           | Category                                                                                                                                             | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) |   | Engg Sciences | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) |   | Project/Term Paper//Semin ar/ Internship (PR) |
|                                                                                                                             |                                                                                                                                                      |                                                                | √                           |   |               |                        |   |                    |   |                         |   |                    |   |                                               |
| 4                                                                                                                           | Approval                                                                                                                                             | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |   |               |                        |   |                    |   |                         |   |                    |   |                                               |

Higher order linear differential equations with constant coefficients - Method of variation of parameters – **Cauchy's** and **Legendre's linear equations** - simultaneous first order linear equations with constant coefficients.

## **UNIT II VECTOR CALCULUS 12**

Gradient, divergence and curl –Directional derivatives –Irrotational and solenoidal vector fields – vector integration– **Green's theorem in a plane** , **Gauss divergence theorem and Stoke's theorem** (without proofs) – simple applications involving cubes and rectangular parallelepipeds.

## **UNIT III ANALYTIC FUNCTIONS 12**

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy-Riemann equation and sufficient conditions (without proofs) – Harmonic and orthogonal properties of analytic functions – Harmonic conjugate – construction of analytic functions – conformal mapping:  $W = Z + C$ ,  $CZ$ ,  $1/Z$  and bilinear transformation.

## **UNIT IV COMPLEX INTEGRATION 12**

Complex integration – **Statement and application of Cauchy's integral theorem and Cauchy's integral formula** –Taylor and Laurent expansions – Singular points – Residues – Residue theorem –Application of Residue theorem to evaluate real integrals – Unit circle and semi-circular contour (excluding poles on boundaries).

## **UNIT V STATISTICS 12**

Mean, Median, Mode – Moments –Skewness and Kurtosis – Correlation – Rank Correlation – Regression –Chi square test for contingency tables.

### **TEXT BOOK:**

1. R.M.Kannan and B.Vijayakumar“ Engineering Mathematics–II “2<sup>nd</sup>Edition, SRB Publication, Chennai 2007.
2. Bali.N.P and Manish Goyal , “Engineering Mathematics“, 3<sup>rd</sup>Edition, Laxmi Publications (P) Ltd, 2008 .
3. Grewal .B/S “Higher Engineering Mathematics”, 40<sup>th</sup>Editon, Khanna Publications, Delhi, 2007

### **REFERENCES :**

1. Ramana.B.V, “Higher Engineering Mathematic“, Tata McGraw Hill Publishing Company, New Delhi, 2007.
2. Gupta SC, and VK.Kapoor, “Fundamentals Mathematical Statistics”, 11<sup>th</sup>Edition, Sultan Chand Sons, New Delhi, 2014.

|               |                                            |          |          |          |          |
|---------------|--------------------------------------------|----------|----------|----------|----------|
| <b>BPH201</b> | <b>ENGINEERING PHYSICS -II</b>             | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|               | Total Contact Hours - 45                   | 3        | 0        | 0        | 3        |
|               | Prerequisite – ENGINEERING PHYSICS -I      |          |          |          |          |
|               | Course Designed by – Department of Physics |          |          |          |          |

| OBJECTIVES                                                                                                                                                                                                                                                                                                                                                 |                                                                       |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
| <ul style="list-style-type: none"><li>To expose the students to multiple areas of science of engineering materials which have direct relevance to different Engineering applications</li><li>To understand the concepts and applications of conducting, Semiconducting, magnetic &amp; dielectric materials as well as their optical properties.</li></ul> |                                                                       |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |
| COURSE OUTCOMES (COs)                                                                                                                                                                                                                                                                                                                                      |                                                                       |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |
| CO1                                                                                                                                                                                                                                                                                                                                                        | Understand about properties and advancements of conducting materials. |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |
| CO2                                                                                                                                                                                                                                                                                                                                                        | Understand the principle and properties semiconducting materials.     |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |
| CO3                                                                                                                                                                                                                                                                                                                                                        | Acquire Knowledge on Magnetic and dielectric Materials.               |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |
| CO4                                                                                                                                                                                                                                                                                                                                                        | To Know about the creation of new materials with novel properties     |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |
| CO5                                                                                                                                                                                                                                                                                                                                                        | To Understand the impact of modern materials in technical uses.       |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |
| CO6                                                                                                                                                                                                                                                                                                                                                        | Learn new engineering materials and its characteristics               |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                                                                                                                                                                                                                |                                                                       |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |
| 1                                                                                                                                                                                                                                                                                                                                                          | COs/POs                                                               | a                                                              | b | c                           | d | e                  | f | g                      | h | I                  | j | k                       | l |                    |                                              |
| 2                                                                                                                                                                                                                                                                                                                                                          | CO1                                                                   | H                                                              |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                                                                                                                                                                                                            | CO2                                                                   |                                                                | L | H                           |   | M                  |   |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                                                                                                                                                                                                            | CO3                                                                   |                                                                | M |                             | H |                    |   |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                                                                                                                                                                                                            | CO4                                                                   | H                                                              |   | M                           | L |                    |   |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                                                                                                                                                                                                            | CO5                                                                   |                                                                | L | L                           |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                                                                                                                                                                                                            | CO6                                                                   | H                                                              |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |
| 3                                                                                                                                                                                                                                                                                                                                                          | Category                                                              | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) |   | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper//Seminar/ Internship (PR) |
|                                                                                                                                                                                                                                                                                                                                                            |                                                                       |                                                                |   | √                           |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |
| 4                                                                                                                                                                                                                                                                                                                                                          | Approval                                                              | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |

## UNIT I CONDUCTING MATERIALS

9

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

## UNIT II SEMICONDUCTING MATERIALS

9

Intrinsic semiconductor – carrier concentration derivation Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – compound semiconductors -direct and indirect band gap- derivation of carrier concentration in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration — Hall effect –Determination of Hall coefficient – Applications.

## UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS

9

Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – antiferromagnetic materials – Ferrites and its applications Superconductivity : properties – Type I and Type II superconductors – BCS theory of superconductivity(Qualitative) - High T<sub>c</sub> superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

#### UNIT IV DIELECTRIC MATERIALS

9

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Clausius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

#### UNIT V ADVANCED ENGINEERING MATERIALS

9

Metallic glasses: preparation, properties and applications. Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, Nanomaterials– Preparation -pulsed laser deposition – chemical vapour deposition – Applications – NLO materials –Birefringence- optical Kerr effect – Classification of Biomaterials and its applications.

#### TEXT BOOKS:

1. Jayaraman D Engineering Physics II. Global Publishing House, 2014.
2. Palanisamy P.K. Materials Science. SCITECH Publishers, 2011.
3. Senthilkumar G. Engineering Physics II. VRB Publishers, 2011.

#### REFERENCES:

- 1.Arumugam M., Materials Science. Anuradha publishers, 2010
2. Pillai S.O., Solid State Physics. New Age International(P) Ltd., publishers, 2009
3. Marikani A. Engineering Physics. PHI Learning Pvt., India, 2009
- 4 <http://ocw.mit.edu/courses/find-by-topic>
- 5 <http://nptel.ac.in/course.php?disciplineId=122>
- 6 [https://en.wikipedia.org/wiki/Engineering\\_physics](https://en.wikipedia.org/wiki/Engineering_physics)

|                                                                                                                                                          |                                                                                            |   |   |   |   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---|---|---|---|
| BCH 201                                                                                                                                                  | ENGINEERING CHEMISTRY-II                                                                   | L | T | P | C |
|                                                                                                                                                          | Total Contact Hours - 45                                                                   | 3 | 0 | 0 | 3 |
|                                                                                                                                                          | Prerequisite – ENGINEERING CHEMISTRY –I                                                    |   |   |   |   |
|                                                                                                                                                          | Course Designed by – Department of Chemistry                                               |   |   |   |   |
| <b>OBJECTIVES</b><br>To impart a sound knowledge on the principles of chemistry involving application oriented to required for all engineering branches. |                                                                                            |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                             |                                                                                            |   |   |   |   |
| CO1                                                                                                                                                      | Students will understand the concepts and further industrial applications of sur chemistry |   |   |   |   |
| CO2                                                                                                                                                      | To impart knowledge about the Industrial importance of Phase rule and alloys               |   |   |   |   |

|                                                                                                                             |                                                                                                    |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                             |  |
|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|---------------------------------------------|--|
| CO3                                                                                                                         | To make the students to be conversant with Analytical techniques of chemistry and their importance |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                             |  |
| CO4                                                                                                                         | To have an idea and knowledge about the Chemistry of Fuels and                                     |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                             |  |
| CO5                                                                                                                         | Understanding of engineering materials                                                             |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                             |  |
| CO6                                                                                                                         | All about bonding and molecular structures                                                         |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                             |  |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                    |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                             |  |
| 1                                                                                                                           | COs/POs                                                                                            | a                                                              | b | c                           | d | e                  | f | g                      | h | i                  | j | k                       | l |                    |  |                                             |  |
| 2                                                                                                                           | CO1                                                                                                | H                                                              | H | L                           |   | H                  |   | H                      |   |                    |   | M                       |   |                    |  |                                             |  |
|                                                                                                                             | CO2                                                                                                |                                                                | H |                             |   | H                  |   | H                      |   |                    |   |                         |   |                    |  |                                             |  |
|                                                                                                                             | CO3                                                                                                | H                                                              |   | L                           |   | H                  |   | H                      |   |                    |   | M                       |   |                    |  |                                             |  |
|                                                                                                                             | CO4                                                                                                |                                                                |   | L                           |   | H                  |   | H                      |   |                    |   |                         |   |                    |  |                                             |  |
|                                                                                                                             | CO5                                                                                                |                                                                |   | L                           |   | H                  |   | H                      |   |                    |   |                         |   |                    |  |                                             |  |
|                                                                                                                             | CO6                                                                                                |                                                                |   | L                           |   | H                  |   | H                      |   | H                  |   | M                       |   |                    |  |                                             |  |
| 3                                                                                                                           | Category                                                                                           | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) |   | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) |  | Project/Term Paper/Seminar/ Internship (PR) |  |
|                                                                                                                             |                                                                                                    |                                                                |   | √                           |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                             |  |
| 4                                                                                                                           | Approval                                                                                           | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                             |  |

## UNIT I SURFACE CHEMISTRY

9

Introduction : Adsorption , absorption , desorption , adsorbent , adsorbate and sorption – (definition only) Differences between adsorption and absorption Adsorption of gases on solids – factors affecting adsorption of gases on solids – Adsorption isotherms –Frendlich adsorption isotherm and Langmuir adsorption isotherm Role of adsorbents in catalysis, Ion-exchange adsorption and pollution abatement.

## UNIT II PHASE RULE AND ALLOYS

9

Introduction :Statement of Phase Rule and explanation of terms involved – one component system – water system – Construction of phase diagram by thermal analysis - Condensed phase rule [Definition only] Two Component System : Simple eutectic systems (lead-silver system only) – eutectic temperature – eutectic composition – Pattinsons Process of desilverisation of Lead Alloys: Importance, ferrous alloys –nichrome and stainless steel – 18/8 stainless steel -heat treatment of steel – annealing – hardening – tempering normalizing – carburizing - nit riding . Non- ferrous alloys: Brass and Bronze

## UNIT III ANALYTICAL TECHNIQUES

9

Introduction: Type of Spectroscopy - Atomic spectroscopy – molecular spectroscopy - Explanation IR spectroscopy – principles – instrumentation (block diagram only) – applications - finger print region UV-visible spectroscopy — principle – instrumentation (block diagram only) – Beer-Lambert's law- – estimation of iron by colorimetry– Atomic absorption spectroscopy- principle - instrumentation (block diagram only) - estimation of Nickel by Atomic absorption spectroscopy

Flame photometry– principles – instrumentation (block diagram only) - estimation of sodium ion by Flame photometry

#### UNIT IV FUELS

9

Introduction : Calorific value – types of Calorific value - gross calorific value – net calorific value  
Analysis of Coal -- Proximate and ultimate analysis – hydrogenation of coal - Metallurgical coke – manufacture by Otto-Hoffmann method Petroleum processing and fractions – cracking – catalytic cracking – types – fixed bed catalytic cracking method- Octane number and Cetane number (definition only) Synthetic petrol – Bergius processes – Gaseous fuels- water gas, producer gas, CNG and LPG (definition and composition only) Flue gas analysis – importance - Orsat apparatus

#### UNIT V ENGINEERING MATERIALS

9

**Introduction:** Refractory's – classification – acidic, basic and neutral refractory's – properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling) Manufacture of Refractory's: alumina bricks and Magnesite bricks, Abrasives – natural and synthetic abrasives Natural type : Siliceous - quartz ; Non –siliceous – diamond Synthetic Abrasives : silicon carbide and boron carbide. Lubricants: Liquid lubricants - Properties – viscosity index, flash and fire points, cloud and pour points, oiliness) Solid lubricants – graphite and molybdenum sulphide

#### TEXT BOOKS:

1. P.C.Jain and Monica Jain, “Engineering Chemistry” Dhanpat Rai Pub, Co., New Delhi (2002).
2. S.S.Dara “A text book of Engineering Chemistry” S.Chand & Co.Ltd., New Delhi (2006).
3. P. J. Lucia, M. Subhashini, “Engineering Chemistry, Volume 1”, Crystal Publications, Chennai, (2007).

#### REFERENCES:

1. B.Sivasankar “Engineering Chemistry” Tata McGraw-Hill Pub. Co.Ltd, New Delhi,(2008)
2. B.K.Sharma “Engineering Chemistry” Krishna Prakasan Media (P) Ltd., Meerut (2001).
3. <http://ocw.mit.edu/courses/find-by-topic>
4. <http://nptel.ac.in/course.php?disciplineId=122>
5. <https://en.wikipedia.org/wiki/Spectroscopy>

| BFR 201                                                                                                                           | FRENCH                                                                                                                | L | T | P | C |
|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|---|---|---|---|
|                                                                                                                                   | Total Contact Hours – 45                                                                                              | 3 | 0 | 0 | 3 |
|                                                                                                                                   | Prerequisite – +2 Level English                                                                                       |   |   |   |   |
|                                                                                                                                   | Course Designed by – Department of English                                                                            |   |   |   |   |
| <b>OBJECTIVES</b>                                                                                                                 |                                                                                                                       |   |   |   |   |
| Language gives access and insights into another culture. It is a fundamental truth that cult define themselves through languages. |                                                                                                                       |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                      |                                                                                                                       |   |   |   |   |
| CO1                                                                                                                               | Introduce the basics of the language to beginners                                                                     |   |   |   |   |
| CO2                                                                                                                               | Understand a dialogue and dialogue presentation                                                                       |   |   |   |   |
| CO3                                                                                                                               | To develop their knowledge as well as their communicative skills so as to be abl respond in simple everyday contexts. |   |   |   |   |

|                                                                                                                             |                                                                                                                                                                                                                                                               |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|----------------------------------------------|---|---|---|---|
| CO4                                                                                                                         | Synchronies I includes documents which initiate the learners to another world, and culture and which acclimatize them to the authentic use of the French language thro the exploitation of written and iconographic documents. The Indian context has b used. |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| CO5                                                                                                                         | Grammatical and lexical notions as well as activities required for communication learnt by the students.                                                                                                                                                      |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| CO6                                                                                                                         | Interpreting skills and confidence in the language.                                                                                                                                                                                                           |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| CO6                                                                                                                         | Interpreting skills and confidence in the language.                                                                                                                                                                                                           |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                                                                                                                                                                               |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| 1                                                                                                                           | COs/POs                                                                                                                                                                                                                                                       | a                                                              | b                           | c                  | d                      | e                  | f                       | g                  | h                                            | i | j | k | l |
| 2                                                                                                                           | CO1                                                                                                                                                                                                                                                           | H                                                              | L                           |                    |                        |                    |                         |                    |                                              |   |   |   |   |
|                                                                                                                             | CO2                                                                                                                                                                                                                                                           |                                                                |                             | H                  | L                      |                    |                         |                    | H                                            | H | M | L | L |
|                                                                                                                             | CO3                                                                                                                                                                                                                                                           |                                                                |                             | H                  | L                      |                    |                         |                    | H                                            | H | M | L | L |
|                                                                                                                             | CO4                                                                                                                                                                                                                                                           |                                                                |                             | H                  |                        |                    |                         |                    | H                                            | H | M | L | L |
|                                                                                                                             | CO5                                                                                                                                                                                                                                                           |                                                                |                             | H                  | L                      |                    |                         |                    | H                                            | H | M |   | L |
|                                                                                                                             | CO6                                                                                                                                                                                                                                                           |                                                                |                             | H                  |                        |                    |                         |                    | H                                            | H | M |   | L |
| 3                                                                                                                           | Category                                                                                                                                                                                                                                                      | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper//Seminar/ Internship (PR) |   |   |   |   |
|                                                                                                                             |                                                                                                                                                                                                                                                               | √                                                              |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| 4                                                                                                                           | Approval                                                                                                                                                                                                                                                      | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |

## UNIT I INTRODUCTION

8

At the airport: Savoir- faire: exchanging greetings, self introduction, introducing another, welcoming someone, identifying someone - Grammar: verbs 'to be', 'to call oneself', subject pronouns, interrogation

## UNIT II GRAMMAR

8

At the University: Savoir-faire: enquiring after one's welfare, taking leave, expressing appreciation -Grammar: definite & indefinite articles, gender of nouns, adjectives, present tense of regular 'er' verbs, 'to have', 'to learn', negation, irregular verbs

## UNIT III CONVERSATION

8

At the café: Savoir –faire: speaking about one's likes, giving information, expressing admiration, asking information about someone - Grammar: Interrogative adjectives, irregular verbs, possessive and interrogative adjectives

## UNIT IV PROPOSAL WRITING

7

At the beach: Savoir faire: proposing an outing, accepting/ refusing the proposal - Grammar: singular & plural, indefinite pronoun, demonstrative adjectives, negation, irregular verbs

**UNIT V FORMAL LETTERS**

7

A concert: Savoir –faire: inviting, accepting, expressing one's inability to accept an invitation

**UNIT VI REGULAR & IRREGULAR VERBS**

7

Grammar: Present tense of more irregular verbs, contracted articles, future tense, interrogative adverbs, **At Nalli's** Savoir- faire: asking the price of an article, protesting against the price, Grammar: possessive adjectives, Exclamative adjectives, imperative tense

**REFERENCES:**

1. Course Material: Synchronie I –Méthode de Français
2. Madanagobalane -Samita Publications, Chennai, 2007

|                                                                                                                                                                         |                                                                       |                                  |                             |                    |                        |                    |                         |                    |                                             |          |          |          |   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|----------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---------------------------------------------|----------|----------|----------|---|
| <b>BGM 201</b>                                                                                                                                                          | <b>GERMAN</b>                                                         |                                  |                             |                    |                        |                    |                         |                    | <b>L</b>                                    | <b>T</b> | <b>P</b> | <b>C</b> |   |
|                                                                                                                                                                         | Total Contact Hours – 45                                              |                                  |                             |                    |                        |                    |                         |                    | 3                                           | 0        | 0        | 3        |   |
|                                                                                                                                                                         | Prerequisite +2 Level English                                         |                                  |                             |                    |                        |                    |                         |                    |                                             |          |          |          |   |
|                                                                                                                                                                         | Course Designed by – Department of English                            |                                  |                             |                    |                        |                    |                         |                    |                                             |          |          |          |   |
| <b>OBJECTIVES</b>                                                                                                                                                       |                                                                       |                                  |                             |                    |                        |                    |                         |                    |                                             |          |          |          |   |
| At the end of this course, students shall be able to obtain good knowledge of the language, to read and write and speak German, whereby the emphasis is laid on speech. |                                                                       |                                  |                             |                    |                        |                    |                         |                    |                                             |          |          |          |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                            |                                                                       |                                  |                             |                    |                        |                    |                         |                    |                                             |          |          |          |   |
| CO1                                                                                                                                                                     | Will have a basic knowledge of the language                           |                                  |                             |                    |                        |                    |                         |                    |                                             |          |          |          |   |
| CO2                                                                                                                                                                     | Will acquire reading and writing skills.                              |                                  |                             |                    |                        |                    |                         |                    |                                             |          |          |          |   |
| CO3                                                                                                                                                                     | Will develop basic conversational skills.                             |                                  |                             |                    |                        |                    |                         |                    |                                             |          |          |          |   |
| CO4                                                                                                                                                                     | Will understand German lifestyle                                      |                                  |                             |                    |                        |                    |                         |                    |                                             |          |          |          |   |
| CO5                                                                                                                                                                     | Will gain confidence to survive in a global environment               |                                  |                             |                    |                        |                    |                         |                    |                                             |          |          |          |   |
| CO6                                                                                                                                                                     | Will have attained to survive and adopt change in a foreign culture . |                                  |                             |                    |                        |                    |                         |                    |                                             |          |          |          |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                             |                                                                       |                                  |                             |                    |                        |                    |                         |                    |                                             |          |          |          |   |
| 1                                                                                                                                                                       | COs/POs                                                               | a                                | b                           | c                  | d                      | e                  | f                       | g                  | h                                           | i        | j        | k        | l |
| 2                                                                                                                                                                       | CO1                                                                   | H                                | L                           |                    |                        |                    |                         |                    |                                             |          |          |          |   |
|                                                                                                                                                                         | CO2                                                                   |                                  |                             | H                  | L                      |                    |                         |                    | H                                           | H        | M        | L        | L |
|                                                                                                                                                                         | CO3                                                                   |                                  |                             | H                  | L                      |                    |                         |                    | H                                           | H        | M        | L        | L |
|                                                                                                                                                                         | CO4                                                                   |                                  |                             | H                  |                        |                    |                         |                    | H                                           | H        | M        | L        | L |
|                                                                                                                                                                         | CO5                                                                   |                                  |                             | H                  | L                      |                    |                         |                    | H                                           | H        | M        |          | L |
|                                                                                                                                                                         | CO6                                                                   |                                  |                             | H                  |                        |                    |                         |                    | H                                           | H        | M        |          | L |
| 3                                                                                                                                                                       | Category                                                              | Humanities & Social Studies (HS) | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper//Seminar Internship (PR) |          |          |          |   |
|                                                                                                                                                                         |                                                                       | ✓                                |                             |                    |                        |                    |                         |                    |                                             |          |          |          |   |

|   |          |                                                                |
|---|----------|----------------------------------------------------------------|
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |
|---|----------|----------------------------------------------------------------|

### Course structure:

- A. German Language (speaking, reading, writing, grammar and test)
- B. Life in Germany (shopping, restaurant, doctor, government, bank, post)
- C. The German Way (introduction, doing business, conversation, meetings, dining)
- D. Germany (Culture, Climate)

### UNIT I PRONOUNCIATION 9

Welcome: Introduction to the Language, Spelling and Pronunciation (The alphabets and numbers) Greetings, ordering, requesting, saying thank you - Grammar – **the article “the”, conjugation** of verbs

### UNIT II SELF INTRODUCTION 9

Shopping - Grammar – adjectives, endings before nouns, practice. Self Introduction

### UNIT III TRAINING 9

Addresses, Occupations, Studies - Grammar - ‘**to be**’, **the definite/indefinite** articles, individual Training

### UNIT IV ORAL 9

Leisure Time, Sports, Hobbies - Grammar – position of a verb in a main clause , oral practice

### UNIT V NARRATION 9

At a Restaurant, Food and Drink - Grammar – the personal pronoun in the Nominative and Accusative, Narrating an event

### RESOURCES:

1. Sprachkurs Deutsch 1 ( Verlag Diesterweg), New Delhi Learning Centre

|                                                                               |                                                                       |   |   |   |   |
|-------------------------------------------------------------------------------|-----------------------------------------------------------------------|---|---|---|---|
| BJP 201                                                                       | JAPANESE                                                              | L | T | P | C |
|                                                                               | Total Contact Hours - 45                                              | 3 | 0 | 0 | 3 |
|                                                                               | Prerequisite – +2 Level English                                       |   |   |   |   |
|                                                                               | Course Designed by – Department of English                            |   |   |   |   |
| OBJECTIVES                                                                    |                                                                       |   |   |   |   |
| To have a basic knowledge of Japanese language, Japanese culture and heritage |                                                                       |   |   |   |   |
| To impart knowledge Japanese lifestyle.                                       |                                                                       |   |   |   |   |
| To give sufficient exposure to develop basic conversational skills.           |                                                                       |   |   |   |   |
| COURSE OUTCOMES (COs)                                                         |                                                                       |   |   |   |   |
| CO1                                                                           | Will have a basic knowledge of the language                           |   |   |   |   |
| CO2                                                                           | Will acquire reading and writing skills.                              |   |   |   |   |
| CO3                                                                           | Will develop basic conversational skills.                             |   |   |   |   |
| CO4                                                                           | Will understand Japanese lifestyle                                    |   |   |   |   |
| CO5                                                                           | Will gain confidence to survive in a global environment               |   |   |   |   |
| CO6                                                                           | Will have attained to survive and adopt change in a foreign culture . |   |   |   |   |

| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                |                             |                    |                        |                    |                         |                    |                                         |   |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|-----------------------------------------|---|---|---|---|
| 1                                                                                                                           | COs/POs  | a                                                              | b                           | c                  | d                      | e                  | f                       | g                  | h                                       | i | j | k | l |
| 2                                                                                                                           | CO1      | H                                                              | L                           |                    |                        |                    |                         |                    |                                         |   |   |   |   |
|                                                                                                                             | CO2      |                                                                |                             | H                  | L                      |                    |                         |                    | H                                       | H | M | L | L |
|                                                                                                                             | CO3      |                                                                |                             | H                  | L                      |                    |                         |                    | H                                       | H | M | L | L |
|                                                                                                                             | CO4      |                                                                |                             | H                  |                        |                    |                         |                    | H                                       | H | M | L | L |
|                                                                                                                             | CO5      |                                                                |                             | H                  | L                      |                    |                         |                    | H                                       | H | M |   | L |
|                                                                                                                             | CO6      |                                                                |                             | H                  |                        |                    |                         |                    | H                                       | H | M |   | L |
| 3                                                                                                                           | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship |   |   |   |   |
|                                                                                                                             |          | √                                                              |                             |                    |                        |                    |                         |                    |                                         |   |   |   |   |
| 4                                                                                                                           | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                         |   |   |   |   |

#### UNIT I CULTURAL HERITAGE

9

Introduction-history and origin of Japanese language-Japan and its cultural heritage-Self introduction-counting numbers (1-100)-time-conversation with the use of audio devices, grammar- usage of particles wa, no, mo and ka

#### UNIT II USAGE

9

Greetings, seasons, days of the week and months of the year-numbers (up to 99,999)-grammar-usage of kore, sore, are, kono, sono, ano, koko and kochira, arimasu and imasu-i-ending and na-ending adjectives-use of audio and drills for practice

#### UNIT III ORAL

9

Asking the price-associated vocabulary-usage of particles ni, ga and ne- use of audio and drills for practice-Introduction to basic Kanji characters- use of audio and drills for practice

#### UNIT IV ART AND CULTURE

9

Family relationships- colours-Kanji (numbers) and festivals of Japan-religion-Japanese art and culture-ikebana, origami-introduction to hiragana- use of audio and drills for practice

#### UNIT V DRILLS AND PRACTICE

9

Vocabulary associated with directions-asking way-particles – e, de, mo, koko, soko, asoko, doko, nani, mae, ushiro, ue, shita- use of audio and drills for practice-introduction to katakana

#### TEXT BOOKS

1. Japanese Hiragana and Katakana for beginners, Timothy G. Stout, 2011
2. Genki I: An integrated course in elementary Japanese, Eri Banno and Yuko Ikeda, 2011

#### REFERENCE BOOKS

1. Japanese Reader collection Volume I, Yumi Boutwell and Clay Boutwell, Kotoba books, 2013
2. Living Language Japanese Complete Edition beginners through advanced course, Living Language, 2012

|                                                                                                                             |                                                                       |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |   |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|----------------------------------------------|----------|----------|----------|---|
| <b>BKR 201</b>                                                                                                              | <b>KOREAN</b>                                                         |                                                                |                             |                    |                        |                    |                         |                    | <b>L</b>                                     | <b>T</b> | <b>P</b> | <b>C</b> |   |
|                                                                                                                             | Total Contact Hours - 45                                              |                                                                |                             |                    |                        |                    |                         |                    | 3                                            | 1        | 0        | 3        |   |
|                                                                                                                             | Prerequisite – +2 Level English                                       |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |   |
|                                                                                                                             | Course Designed by – Department of English                            |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |   |
| <b>OBJECTIVES</b>                                                                                                           |                                                                       |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |   |
| To have a basic knowledge of Korean language, Korean culture and heritage                                                   |                                                                       |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |   |
| To impart knowledge on Korean lifestyle and heritage.                                                                       |                                                                       |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                |                                                                       |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |   |
| CO1                                                                                                                         | Will have a basic knowledge of the language                           |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |   |
| CO2                                                                                                                         | Will acquire reading and writing skills.                              |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |   |
| CO3                                                                                                                         | Will develop basic conversational skills.                             |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |   |
| CO4                                                                                                                         | Will understand Korean lifestyle                                      |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |   |
| CO5                                                                                                                         | Will gain confidence to survive in a global environment               |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |   |
| CO6                                                                                                                         | Will have attained to survive and adopt change in a foreign culture . |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                       |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |   |
| 1                                                                                                                           | COs/POs                                                               | a                                                              | b                           | c                  | d                      | e                  | f                       | g                  | h                                            | i        | j        | k        | l |
| 2                                                                                                                           | CO1                                                                   | H                                                              | L                           |                    |                        |                    |                         |                    |                                              |          |          |          |   |
|                                                                                                                             | CO2                                                                   |                                                                |                             | H                  | L                      |                    |                         |                    | H                                            | H        | M        | L        | L |
|                                                                                                                             | CO3                                                                   |                                                                |                             | H                  | L                      |                    |                         |                    | H                                            | H        | M        | L        | L |
|                                                                                                                             | CO4                                                                   |                                                                |                             | H                  |                        |                    |                         |                    | H                                            | H        | M        | L        | L |
|                                                                                                                             | CO5                                                                   |                                                                |                             | H                  | L                      |                    |                         |                    | H                                            | H        | M        |          | L |
|                                                                                                                             | CO6                                                                   |                                                                |                             | H                  |                        |                    |                         |                    | H                                            | H        | M        |          | L |
| 3                                                                                                                           | Category                                                              | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |          |          |          |   |
|                                                                                                                             | √                                                                     |                                                                |                             |                    |                        |                    |                         |                    |                                              |          |          |          |   |
| 4                                                                                                                           | Approval                                                              | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                              |          |          |          |   |

## UNIT I PLANNING

9

Asking/giving reasons for studying Korean, making plans for the holiday, writing letters, describing past travel experiences and future travel plans, shopping in a grocery store, shopping in electronics store, storytelling Grammar: would like to (do), want to (do), construct future tense.

## UNIT II MODIFIERS

9

Asking about feelings, asking about problems and giving advice, brief introductions - Grammar: Noun modifier, please try doing (something), irregular adjective/verb

## UNIT III PLACING ORDERS

9

Asking about hobbies, asking about abilities (sports), job requirements, Ordering things for delivery, ordering a meal at a restaurant - Grammar: Sentence ending for the honorific form, please do something for me, have tried (something),

**UNIT IV DESCRIPTIONS****9**

Asking about evening plans, making plans with others, making preparations - Asking about rooms, describing your room to your classmates, describing your house. Grammar: to know/not know how to do something, must (do), have to (do), should,

**UNIT V GRAMMAR****9**

Describing your plans and giving reasons, cancelling appointments. Grammar: Shall we~? / Should we~?, with, and, irregular verbs/adjective, so, because, cannot, intend to, plan to, or hope to, (more) than, the most, tag question/is n't it? ,will (do)

**COURSE MATERIAL:**

Korean for Non-Native Speakers (Student Book 1B) Korean Language Education Center, Sogang University

|                                                                             |          |                                                                     |                |                    |                        |      |                         |                    |                                            |   |   |   |   |
|-----------------------------------------------------------------------------|----------|---------------------------------------------------------------------|----------------|--------------------|------------------------|------|-------------------------|--------------------|--------------------------------------------|---|---|---|---|
| BCN 201                                                                     |          | CHINESE                                                             |                |                    |                        |      |                         |                    |                                            | L | T | P | C |
|                                                                             |          | Total Contact Hours - 60                                            |                |                    |                        |      |                         |                    |                                            | 3 | 0 | 0 | 3 |
|                                                                             |          | Prerequisite – +2 Level English                                     |                |                    |                        |      |                         |                    |                                            |   |   |   |   |
|                                                                             |          | Course Designed by – Department of English                          |                |                    |                        |      |                         |                    |                                            |   |   |   |   |
| OBJECTIVES                                                                  |          |                                                                     |                |                    |                        |      |                         |                    |                                            |   |   |   |   |
| To have a basic knowledge of Chinese language, Chinese culture and heritage |          |                                                                     |                |                    |                        |      |                         |                    |                                            |   |   |   |   |
| To impart knowledge on Chinese lifestyle and heritage.                      |          |                                                                     |                |                    |                        |      |                         |                    |                                            |   |   |   |   |
| COURSE OUTCOMES (COs)                                                       |          |                                                                     |                |                    |                        |      |                         |                    |                                            |   |   |   |   |
| CO1                                                                         |          | Will have a basic knowledge of the language                         |                |                    |                        |      |                         |                    |                                            |   |   |   |   |
| CO2                                                                         |          | Will acquire reading and writing skills.                            |                |                    |                        |      |                         |                    |                                            |   |   |   |   |
| CO3                                                                         |          | Will develop basic conversational skills.                           |                |                    |                        |      |                         |                    |                                            |   |   |   |   |
| CO4                                                                         |          | Will understand Chinese lifestyle                                   |                |                    |                        |      |                         |                    |                                            |   |   |   |   |
| CO5                                                                         |          | Will gain confidence to survive in a global environment             |                |                    |                        |      |                         |                    |                                            |   |   |   |   |
| CO6                                                                         |          | Will have attained to survive and adopt change in a foreign culture |                |                    |                        |      |                         |                    |                                            |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)                      |          |                                                                     |                |                    |                        |      |                         |                    |                                            |   |   |   |   |
| (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low           |          |                                                                     |                |                    |                        |      |                         |                    |                                            |   |   |   |   |
| 1                                                                           | COs/POs  | a                                                                   | b              | c                  | d                      | e    | f                       | g                  | h                                          | i | j | k | l |
| 2                                                                           | CO1      | H                                                                   | L              |                    |                        |      |                         |                    |                                            |   |   |   |   |
|                                                                             | CO2      |                                                                     |                | H                  | L                      |      |                         |                    | H                                          | H | M | L | L |
|                                                                             | CO3      |                                                                     |                | H                  | L                      |      |                         |                    | H                                          | H | M | L | L |
|                                                                             | CO4      |                                                                     |                | H                  |                        |      |                         |                    | H                                          | H | M | L | L |
|                                                                             | CO5      |                                                                     |                | H                  | L                      |      |                         |                    | H                                          | H | M |   | L |
|                                                                             | CO6      |                                                                     |                | H                  |                        |      |                         |                    | H                                          | H | M |   | L |
| 3                                                                           | Category | Humanities & Social Studies                                         | Basic Sciences | Engg Sciences (ES) | Professional Core (PC) | Core | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/Seminar/Internship (PR) |   |   |   |   |
|                                                                             |          | √                                                                   |                |                    |                        |      |                         |                    |                                            |   |   |   |   |

|   |          |                                                                |
|---|----------|----------------------------------------------------------------|
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |
|---|----------|----------------------------------------------------------------|

# **UNIT 1      RISE OF DIALECTS      9**

History, Origins, Old and middle Chinese, Rise of northern dialects

# **UNIT II VARIETIES      9**

Influences 3 Varieties of Chinese. 1. Classification 2. Standard Chinese and 3. Nomenclature

# **UNIT III      CHARACTERS      9**

Chinese characters, Homophones, Phonology

# **UNIT IV      TRANSCRIPTIONS      9**

Tones, Phonetic transcriptions, Romanization, Other phonetic transcriptions

# **UNIT V      GRAMMAR      9**

Grammar and morphology, Vocabulary, Loanwords, Modern borrowings and loanwords

## **REFERENCES:**

1. Hannas, William C. (1997), Asia's Orthographic Dilemma, University of Hawaii Press, ISBNHYPERLINK "<http://en.wikipedia.org/wiki/Special:BookSources/978-0-8248-1892-0>" 978-0-8248-1892-0.
2. Qiu, Xigui (2000), Chinese Writing, trans. Gilbert Louis Mattos and Jerry Norman, Society for the Study of Early China and Institute of East Asian Studies, University of California, Berkeley, ISBNHYPERLINK "<http://en.wikipedia.org/wiki/Special:BookSources/978-1-55729-071-7>", 978-1-55729-071-7.
3. Ramsey, S. Robert (1987), The Languages of China, Princeton University Press, ISBNHYPERLINK "<http://en.wikipedia.org/wiki/Special:BookSources/978-0-691-01468-5>" 978-0-691-01468-5.
4. Schuessler, Axel (2007), ABC Etymological Dictionary of Old Chinese, Honolulu: University of Hawaii Press, ISBNHYPERLINK "<http://en.wikipedia.org/wiki/Special:BookSources/978-0-8248-2975-9>" 978-0-8248-2975-9.
5. R. L. G. "Language borrowing Why so little Chinese in English?" The Economist. June 6, 201

|                                                                             |                                                                                                                       |          |          |          |          |
|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------|----------|----------|----------|
| <b>BME 202</b>                                                              | <b>ENGINEERING MECHANICS</b>                                                                                          | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                             | Total Contact Hours – 60                                                                                              | 3        | 1        | 0        | 3        |
|                                                                             | Prerequisite – Engineering Mathematics I , II, Engg. Physics                                                          |          |          |          |          |
|                                                                             | Course Designed by – Department of Mechanical Engineering                                                             |          |          |          |          |
| <b>OBJECTIVES:</b> To understand the concept of basic engineering mechanism |                                                                                                                       |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                |                                                                                                                       |          |          |          |          |
| CO1                                                                         | Students will understand the concepts of engineering mechanics                                                        |          |          |          |          |
| CO2                                                                         | Students will understand the vectorial representation of forces and moments                                           |          |          |          |          |
| CO3                                                                         | Students will gain knowledge regarding center of gravity and moment of inertia and apply them for practical problems. |          |          |          |          |

|                                                                                                                             |                                                                                                                                                            |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|----------------------------------------------|--|
| CO4                                                                                                                         | Students will gain knowledge regarding various types of forces and reactions and tom draw free body diagram to quicker solutions for complicated problems. |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO5                                                                                                                         | Student will gain knowledge in solving problems involving work and energy                                                                                  |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO6                                                                                                                         | Student will gain knowledge on friction on equilibrium and its application.                                                                                |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                                                                            |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| 1                                                                                                                           | COs/POs                                                                                                                                                    | a                                                              | b | c                           | d | e                  | f | g                      | h | i                  | j | k                       | l |                    |  |                                              |  |
| 2                                                                                                                           | CO1                                                                                                                                                        | H                                                              | H | L                           | H |                    | H |                        | L |                    | H | H                       |   |                    |  |                                              |  |
|                                                                                                                             | CO2                                                                                                                                                        |                                                                |   |                             |   |                    | H | H                      | L |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO3                                                                                                                                                        |                                                                |   |                             |   |                    | H | H                      | L |                    | M |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO4                                                                                                                                                        |                                                                |   |                             |   |                    | H | H                      | L |                    | M |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO5                                                                                                                                                        |                                                                |   |                             |   |                    | H | H                      | L |                    | M |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO6                                                                                                                                                        |                                                                |   |                             |   |                    | H | H                      | L |                    | M |                         |   |                    |  |                                              |  |
| 3                                                                                                                           | Category                                                                                                                                                   | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) |   | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) |  | Project/Term Paper/Seminar// Internship (PR) |  |
|                                                                                                                             |                                                                                                                                                            |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| 4                                                                                                                           | Approval                                                                                                                                                   | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |

## UNIT I BASICS AND STATICS OF PARTICLES

12

Introduction - Units and Dimensions - Laws of Mechanics – **Lame's theorem, Parallelogram and triangular Law** of forces – Vectors – Vectorial representation of forces and moments – Vector operations on forces - Coplanar Forces – Resolution and Composition of forces – Resultant of several concurrent forces - Equilibrium of a forces – Forces in space - Equilibrium of particle in space - Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

## UNIT II EQUILIBRIUM OF RIGID BODIES

12

Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples– Scalar components of a moment – **Varignon's theorem** - Equilibrium of Rigid bodies in two dimensions -Equilibrium of Rigid bodies in three dimensions.

## UNIT III PROPERTIES OF SURFACES AND SOLIDS

12

Determination of areas – First moment of area and the Centroid of standard sections – T section, I section, Composite figures, Hollow section – second moments of plane area – Rectangle, triangle, circle - T section, I section, Hollow section – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia – Basic concept of Mass moment of inertia.

## UNIT IV FRICTION

12

Frictional force – Laws of Coloumb friction – Cone of friction – Angle of repose – Simple contact friction – Sliding of blocks – Wedge friction - Ladder friction – Screw Jack – Belt friction - Rolling resistance.

## UNIT V DYNAMICS OF PARTICLES

12

Displacements, Velocity and acceleration, their relationship – Relative motion – Relative acceleration – Curvilinear motion of particles – **Newton's law** – work energy equation – impulse and Momentum – Impact of elastic bodies.

### TEXT BOOK:

1. Beer, F.P and Johnson Jr. E.R, “Vector Mechanics for Engineers: Vol. 1 Statics and vol. 2 Dynamics”, McGraw-Hill International Edition, 2013.
2. Rajasekaran, S, Sankarasubramanian, G., Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt., Ltd., 2011.

### REFERENCES :

1. Kumar, K. L Kumar, V., Engineering Mechanics, Tata McGraw – Hill, New Delhi, 2010
2. Palanichamy, M.S., Nagan, S., Engineering Mechanics – Statics & Dynamics, Tata McGraw - Hill, 2013.
3. Timoshenko, and Young, Engineering Mechanics, Tata McGraw-Hill, New Delhi, 2013.
4. Irving H. Shames, Engineering Mechanics – Statics and Dynamics, IV Edition – Pearson Education Asia Pvt., Ltd., 2006.

|                                                                                                                             |                                                                                                               |  |   |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--|---|---|---|---|
| BEE 201                                                                                                                     | BASIC ELECTRICAL AND ELECTRONICS ENGINEERING                                                                  |  | L | T | P | C |
|                                                                                                                             | Total Contact Hours - 30                                                                                      |  | 2 | 0 | 0 | 2 |
|                                                                                                                             | Prerequisite – Engineering Mathematics, Engineering Physics-I & II                                            |  |   |   |   |   |
|                                                                                                                             | Course Designed by – Department of Electrical & Electronics Engineering                                       |  |   |   |   |   |
| OBJECTIVES: To understand the laws of electrical engineering.                                                               |                                                                                                               |  |   |   |   |   |
| COURSE OUTCOMES (COs)                                                                                                       |                                                                                                               |  |   |   |   |   |
| CO1                                                                                                                         | Students will gain knowledge regarding the various laws and principles associated with electrical systems.    |  |   |   |   |   |
| CO2                                                                                                                         | Students will gain knowledge regarding electrical machines and apply them for practical problems.             |  |   |   |   |   |
| CO3                                                                                                                         | Students will gain knowledge regarding various types semiconductors.                                          |  |   |   |   |   |
| CO4                                                                                                                         | Student will gain knowledge digital electronics.                                                              |  |   |   |   |   |
| CO5                                                                                                                         | Student will gain knowledge on electronic systems.                                                            |  |   |   |   |   |
| CO6                                                                                                                         | Students will acquire knowledge in using the concepts in the field of electrical engg. projects and research. |  |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                               |  |   |   |   |   |

|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                         |   |   |   |   |
|---|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|-----------------------------------------|---|---|---|---|
| 1 | COs/POs  | a                                                              | b                           | c                  | d                      | e                  | f                       | g                  | h                                       | i | j | k | l |
| 2 | CO1      | M                                                              | H                           | M                  |                        |                    | L                       |                    | L                                       | L |   |   |   |
|   | CO2      |                                                                | H                           | M                  |                        |                    | L                       |                    | L                                       | L |   |   |   |
|   | CO3      |                                                                | H                           | M                  |                        |                    | L                       |                    | L                                       |   |   |   |   |
|   | CO4      | M                                                              | H                           | M                  |                        |                    | L                       |                    | L                                       | L |   |   |   |
|   | CO5      | M                                                              | H                           | M                  |                        |                    | L                       |                    | L                                       |   |   |   |   |
|   | CO6      |                                                                | H                           |                    |                        |                    | L                       |                    | L                                       | H |   |   |   |
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship |   |   |   |   |
|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                         |   |   |   |   |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                         |   |   |   |   |

## UNIT I ELECTRIC CIRCUITS

6

Ohm's law – Kirchoff's Laws, V – I Relationship of Resistor (R) Inductor (L) and capacitor (C). Series parallel combination of R, L&C – Current and voltage source transformation – mesh current & node voltage method –superposition theorem –Thevenin's and Norton's Theorem - Problems.

## UNIT II ELECTRICAL MACHINES

6

Construction, principle of operation, Basic Equations and applications - D.C.Generators and D.C.Motors. -Single phase Induction Motor - Single Phase Transformer.

## UNIT III BASIC MEASUREMENT SYSTEMS

6

Introduction to Measurement Systems, Construction and Operating principles of PMMC, Moving Iron, Dynamometer Wattmeter, power measurement by three-watt meter and two watt method – and Energy meter.

## UNIT IV SEMICONDUCTOR DEVICES 6

Basic Concepts of semiconductor devices – PN Junction Diode Characteristics and its Applications – HWR, FWR –Zener Diode – BJT (CB, CE, CC) configuration & Characteristics.

## UNIT V DIGITAL ELECTRONICS 6

Number system – Logic Gates – Boolean Algebra– De-Morgan's Theorem – Half Adder & Full Adder – Flip Flops.

### TEXT BOOKS:

1. N.Mittal "Basic Electrical Engineering". Tata McGraw Hill Edition, New Delhi, 1990.
2. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2004.
3. Jacob Millman and Christos C-Halkias, "Electronic Devices and Circuits", Tata McGraw

**REFERENCE BOOKS:**

1. Edminister J.A. "Theory and Problems of Electric Circuits" Schaum's Outline Series. McGrawHill Book Company, 2<sup>nd</sup> Edition, 1983.
2. Hyatt W.H and Kemmerly J.E. "Engineering Circuit Analysis", McGraw Hill International Editions, 1993.
3. D. P. Kothari and I. J. Nagrath "Electric Machines" Tata McGraw-Hill Education, 2004
4. Millman and Halkias, "Integrated Electronics", Tata McGraw Hill Edition, 2004.

|                                                                                                                             |                                                              |                                                                  |                             |   |                    |   |                        |                    |                         |                    |   |                                              |   |
|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------------|-----------------------------|---|--------------------|---|------------------------|--------------------|-------------------------|--------------------|---|----------------------------------------------|---|
| BCS 2L2                                                                                                                     |                                                              | COMPUTER PRACTICE LABORATORY                                     |                             |   |                    |   |                        |                    | L                       | T                  | P | C                                            |   |
|                                                                                                                             |                                                              | Total Contact Hours - 45                                         |                             |   |                    |   |                        |                    | 0                       | 0                  | 3 | 1                                            |   |
|                                                                                                                             |                                                              | Prerequisite – Fundamentals of Computer                          |                             |   |                    |   |                        |                    |                         |                    |   |                                              |   |
|                                                                                                                             |                                                              | Course Designed by – Department of Computer Science &Engineering |                             |   |                    |   |                        |                    |                         |                    |   |                                              |   |
| OBJECTIVES: To impart basic computer knowledge                                                                              |                                                              |                                                                  |                             |   |                    |   |                        |                    |                         |                    |   |                                              |   |
| COURSE OUTCOMES (COs)                                                                                                       |                                                              |                                                                  |                             |   |                    |   |                        |                    |                         |                    |   |                                              |   |
| CO1                                                                                                                         | Demonstrate major algorithms and data                        |                                                                  |                             |   |                    |   |                        |                    |                         |                    |   |                                              |   |
| CO2                                                                                                                         | Implementation of array operations                           |                                                                  |                             |   |                    |   |                        |                    |                         |                    |   |                                              |   |
| CO3                                                                                                                         | Implementation of binary tree.                               |                                                                  |                             |   |                    |   |                        |                    |                         |                    |   |                                              |   |
| CO4                                                                                                                         | Implementation of linked list                                |                                                                  |                             |   |                    |   |                        |                    |                         |                    |   |                                              |   |
| CO5                                                                                                                         | Students will able to do analyse data using spread sheet     |                                                                  |                             |   |                    |   |                        |                    |                         |                    |   |                                              |   |
| CO6                                                                                                                         | Student will able to understand the basics of C programming. |                                                                  |                             |   |                    |   |                        |                    |                         |                    |   |                                              |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                              |                                                                  |                             |   |                    |   |                        |                    |                         |                    |   |                                              |   |
| 1                                                                                                                           | COs/POs                                                      | a                                                                | b                           | c | d                  | e | f                      | g                  | h                       | i                  | j | k                                            | l |
| 2                                                                                                                           | CO1                                                          | H                                                                | H                           | L | H                  |   | H                      |                    | L                       |                    | H | H                                            | H |
|                                                                                                                             | CO2                                                          |                                                                  |                             |   |                    |   | H                      | H                  | L                       |                    |   |                                              |   |
|                                                                                                                             | CO3                                                          |                                                                  |                             |   |                    |   | H                      | H                  | L                       |                    | M |                                              |   |
|                                                                                                                             | CO4                                                          |                                                                  |                             |   |                    |   | H                      | H                  | L                       |                    | M |                                              |   |
|                                                                                                                             | CO5                                                          |                                                                  |                             |   |                    |   | H                      | H                  | L                       |                    | M |                                              |   |
|                                                                                                                             | CO6                                                          |                                                                  |                             |   |                    |   | H                      | H                  | L                       |                    | M |                                              |   |
| 3                                                                                                                           | Category                                                     | Humanities & Social Studies (HS)                                 | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) |   | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) |   | Project/Term Paper/ Seminar/ Internship (PR) |   |
|                                                                                                                             |                                                              |                                                                  |                             |   | √                  |   |                        |                    |                         |                    |   |                                              |   |
| 4                                                                                                                           | Approval                                                     | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016   |                             |   |                    |   |                        |                    |                         |                    |   |                                              |   |

**A) WORD PROCESSING**

Document creation, Text manipulation with Scientific Notations. Table creation, formatting and Conversion. Mail merge and Letter Preparation. Drawing-Flow Chart

**B) SPREAD SHEET****9**

Chart-Line Xy Bar and Pie – Formula-Formula Editor-Spread sheet-Inclusion of Object, Picture and Graphics Protecting the document and sheet-Sorting and Import/Export features.

**C) SIMPLE C PROGRAMMING\*****15**

Data types, Expression Evaluation, Condition Statement. Arrays structures and Unions – Functions

**D) SIMPLE C++PROGRAMMING****15**

-Classes and Objects  
-Constructor and Destructor

**\*For Programming exercises Flow chart and Pseudo code are essential.**

|                                                                                                                             |                                                                                         |   |   |   |   |   |   |   |   |   |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| BEE2L1                                                                                                                      | BASIC ELECTRICAL AND ELECTRONIC ENGINEERING PRACTICES LABORATORY                        |   |   |   |   |   |   |   |   | L | T | P | C |
|                                                                                                                             | Total Contact Hours – 45                                                                |   |   |   |   |   |   |   |   | 0 | 0 | 3 | 1 |
|                                                                                                                             | Prerequisite – Basic Electrical and Electronics Engineering                             |   |   |   |   |   |   |   |   |   |   |   |   |
|                                                                                                                             | Course Designed by – Department of Electrical & Electronics Engineering                 |   |   |   |   |   |   |   |   |   |   |   |   |
| OBJECTIVES: To enhance the student with knowledge on electrical and electronic equipments                                   |                                                                                         |   |   |   |   |   |   |   |   |   |   |   |   |
| COURSE OUTCOMES (COs)                                                                                                       |                                                                                         |   |   |   |   |   |   |   |   |   |   |   |   |
| CO1                                                                                                                         | Students will able to handle basic electrical equipments.                               |   |   |   |   |   |   |   |   |   |   |   |   |
| CO2                                                                                                                         | Students will able to do staircase wiring.                                              |   |   |   |   |   |   |   |   |   |   |   |   |
| CO3                                                                                                                         | Students will able to understand domestic wiring procedures practically.                |   |   |   |   |   |   |   |   |   |   |   |   |
| CO4                                                                                                                         | Student will able to assemble electronic systems.                                       |   |   |   |   |   |   |   |   |   |   |   |   |
| CO5                                                                                                                         | Students will understand all the fundamental concepts involving electrical engineering  |   |   |   |   |   |   |   |   |   |   |   |   |
| CO6                                                                                                                         | Students will understand all the fundamental concepts involving electronics engineering |   |   |   |   |   |   |   |   |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                         |   |   |   |   |   |   |   |   |   |   |   |   |
| 1                                                                                                                           | COs/POs                                                                                 | a | b | c | d | e | f | g | h | i | j | k | l |
| 2                                                                                                                           | CO1                                                                                     | M | H | M |   |   | L |   | L | L | M | H |   |
|                                                                                                                             | CO2                                                                                     |   | H | M |   |   | L |   | L | L |   | H |   |
|                                                                                                                             | CO3                                                                                     |   | H | M |   |   | L |   | L |   |   | H |   |
|                                                                                                                             | CO4                                                                                     | M | H | M |   |   | L |   | L | L | M | H |   |
|                                                                                                                             | CO5                                                                                     | M | H | M |   |   | L |   | L |   | M | H |   |
|                                                                                                                             | CO6                                                                                     |   | H |   |   |   | L |   | L | H |   | H |   |

|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                             |
|---|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---------------------------------------------|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/Seminar/ Internship (PR) |
|   |          |                                                                |                             | √                  |                        |                    |                         |                    |                                             |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                             |

### I LIST OF EXPERIMENTS FOR ELECTRICAL ENGINEERING LAB

1. Fluorescent lamp wiring
2. Stair case wiring
3. Measurement of electrical quantities-voltage current, power & power factor in RLC circuit
4. Residential house wiring using fuse, switch, indicator, lamp and energy meter
5. Measurement of energy using single phase energy meter
6. Measurement of resistance to earth of electrical equipment

### II LIST OF EXPERIMENTS FOR ELECTRONICS ENGINEERING LAB

1. Study of electronic components and equipments.
  - a. Resistor colour coding using digital multi-meter.
  - b. Assembling electronic components on bread board.
2. Measurement of ac signal parameters using cathode ray oscilloscope and function generator.
3. Soldering and desoldering practice.
4. Verification of logic gates (OR, AND, OR, NOT, NAND, EX-OR).
5. Implementation of half adder circuit using logic gates.

|                                                                                                                             |         |                                                                      |   |   |   |   |   |   |   |          |          |          |          |
|-----------------------------------------------------------------------------------------------------------------------------|---------|----------------------------------------------------------------------|---|---|---|---|---|---|---|----------|----------|----------|----------|
| <b>BPC<br/>1L1/2L1</b>                                                                                                      |         | <b>PHYSICS AND CHEMISTRY LABORATORY</b>                              |   |   |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                                             |         | Total Contact Hours – 45                                             |   |   |   |   |   |   |   | 0        | 0        | 3        | 1        |
|                                                                                                                             |         | Prerequisite – Physics and Chemistry                                 |   |   |   |   |   |   |   |          |          |          |          |
|                                                                                                                             |         | Course Designed by – Department of Physics & Chemistry               |   |   |   |   |   |   |   |          |          |          |          |
| <b>OBJECTIVES:</b> To impart knowledge to the students in practical physics and chemistry                                   |         |                                                                      |   |   |   |   |   |   |   |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                |         |                                                                      |   |   |   |   |   |   |   |          |          |          |          |
| CO1                                                                                                                         |         | Students will understand the concept of hall effect                  |   |   |   |   |   |   |   |          |          |          |          |
| CO2                                                                                                                         |         | Students will understand the concept of semiconductors. .            |   |   |   |   |   |   |   |          |          |          |          |
| CO3                                                                                                                         |         | Student will understand the working of spectrometer.                 |   |   |   |   |   |   |   |          |          |          |          |
| CO4                                                                                                                         |         | Student will able practically understand the chemical reactions.     |   |   |   |   |   |   |   |          |          |          |          |
| CO5                                                                                                                         |         | Students will Study the magnetic hysteresis and energy product       |   |   |   |   |   |   |   |          |          |          |          |
| CO6                                                                                                                         |         | Students understand the Determination of Band gap of a semiconductor |   |   |   |   |   |   |   |          |          |          |          |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |         |                                                                      |   |   |   |   |   |   |   |          |          |          |          |
| 1                                                                                                                           | COs/POs | a                                                                    | b | c | d | e | f | g | h | i        | j        | k        | l        |
| 2                                                                                                                           | CO1     | M                                                                    | H | M |   |   | L |   | L | L        | M        | H        | M        |

|   |          |                                                                |                   |                          |                           |                  |                               |                          |                                                          |   |   |   |   |
|---|----------|----------------------------------------------------------------|-------------------|--------------------------|---------------------------|------------------|-------------------------------|--------------------------|----------------------------------------------------------|---|---|---|---|
|   | CO2      |                                                                | H                 | M                        |                           |                  | L                             |                          | L                                                        | L |   | H |   |
|   | CO3      |                                                                | H                 | M                        |                           |                  | L                             |                          | L                                                        |   |   | H |   |
|   | CO4      | M                                                              | H                 | M                        |                           |                  | L                             |                          | L                                                        | L | M | H | M |
|   | CO6      |                                                                | H                 |                          |                           |                  | L                             |                          | L                                                        | H |   | H |   |
| 3 | Category | Humanities<br>& Social<br>Studies                              | Basic<br>Sciences | Engg<br>Sciences<br>(ES) | Professional<br>Core (PC) | Core<br>Elective | Non-Major<br>Elective<br>(NE) | Open<br>Elective<br>(OE) | Project/Term<br>Paper/<br>Seminar/<br>Internship<br>(PR) |   |   |   |   |
|   |          |                                                                | √                 |                          |                           |                  |                               |                          |                                                          |   |   |   |   |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                   |                          |                           |                  |                               |                          |                                                          |   |   |   |   |

### I -LIST OF EXPERIMENTS – PHYSICS

1. Determination of Wavelength, and particle size using Laser
2. Determination of acceptance angle in an optical fiber.
3. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
4. Determination of wavelength of mercury spectrum – spectrometer grating
5. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
6. Determination of Young's modulus by Non uniform bending method
7. Determination of specific resistance of a given coil of wire – Carey Foster's Bridge
8. Determination of Young's modulus by uniform bending method
9. Determination of band gap of a semiconductor
10. Determination of Coefficient of viscosity of a liquid –Poiseuille's method
11. Determination of Dispersive power of a prism - Spectrometer
12. Determination of thickness of a thin wire – Air wedge method
13. Determination of Rigidity modulus – Torsion pendulum

### II- LIST OF EXPERIMENTS – CHEMISTRY

1. Estimation of hardness of Water by EDTA
2. Estimation of Copper in brass by EDTA
3. Determination of DO in water (Winkler's method)
4. Estimation of Chloride in Water sample (Argentometry)
5. Estimation of alkalinity of Water sample
6. Determination of molecular weight
7. Conduct metric titration (Simple acid base)
8. Conduct metric titration (Mixture of weak and strong acids)
9. Conduct metric titration using BaCl<sub>2</sub> vs Na<sub>2</sub>SO<sub>4</sub>
10. Potentiometric Titration (Fe<sup>2+</sup> / KMnO<sub>4</sub> or K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>)
11. pH titration (acid & base)
12. Determination of water of crystallization of a crystalline salt (Copper Sulphate)
13. Estimation of Ferric iron by spectrophotometer.

|               |                               |          |          |          |          |
|---------------|-------------------------------|----------|----------|----------|----------|
| <b>BMA301</b> | <b>MATHEMATICS – III</b>      | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|               | Total Contact Hours –75       | <b>4</b> | <b>0</b> | <b>0</b> | <b>4</b> |
|               | Prerequisite – Mathematics II |          |          |          |          |

|                                                                                                                                                    |          |                                                                                        |                             |                                                |                    |                        |                    |   |                         |   |                    |                                              |   |
|----------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------|-----------------------------|------------------------------------------------|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|---|
|                                                                                                                                                    |          |                                                                                        |                             | Course Designed by – Dept of Civil Engineering |                    |                        |                    |   |                         |   |                    |                                              |   |
| <b>OBJECTIVES</b>                                                                                                                                  |          |                                                                                        |                             |                                                |                    |                        |                    |   |                         |   |                    |                                              |   |
| 1. To introduce Fourier series analysis this is central to many applications in engineering apart from its use in solving boundary value problems. |          |                                                                                        |                             |                                                |                    |                        |                    |   |                         |   |                    |                                              |   |
| 2. To acquaint the student with Fourier transform techniques used in wide variety of situations.                                                   |          |                                                                                        |                             |                                                |                    |                        |                    |   |                         |   |                    |                                              |   |
| 3. To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes         |          |                                                                                        |                             |                                                |                    |                        |                    |   |                         |   |                    |                                              |   |
| 4. To develop Z transform techniques for discrete time systems.                                                                                    |          |                                                                                        |                             |                                                |                    |                        |                    |   |                         |   |                    |                                              |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                       |          |                                                                                        |                             |                                                |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO1                                                                                                                                                |          | To learn the problem solving methods in linear differential equations                  |                             |                                                |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO2                                                                                                                                                |          | To learn Dirichlet’s condition and operations using Fourier series                     |                             |                                                |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO3                                                                                                                                                |          | To have a clear understanding about 2 <sup>nd</sup> order equations and wave equations |                             |                                                |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO4                                                                                                                                                |          | Properties of Laplace transform and problem solving using it                           |                             |                                                |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO5                                                                                                                                                |          | Properties of Fourier transform and problem solving using it                           |                             |                                                |                    |                        |                    |   |                         |   |                    |                                              |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                        |          |                                                                                        |                             |                                                |                    |                        |                    |   |                         |   |                    |                                              |   |
| 1                                                                                                                                                  | COs/POs  | a                                                                                      | b                           | c                                              | d                  | e                      | f                  | g | h                       | i | j                  | k                                            | l |
| 2                                                                                                                                                  | CO1      | M                                                                                      |                             |                                                |                    |                        |                    |   |                         |   |                    |                                              |   |
|                                                                                                                                                    | CO2      |                                                                                        | M                           | H                                              |                    | H                      |                    |   |                         |   |                    |                                              |   |
|                                                                                                                                                    | CO3      |                                                                                        | M                           |                                                | H                  |                        |                    |   |                         |   |                    |                                              |   |
|                                                                                                                                                    | CO4      | H                                                                                      |                             |                                                | M                  |                        |                    |   |                         |   |                    |                                              |   |
|                                                                                                                                                    | CO5      | H                                                                                      |                             |                                                | M                  | H                      |                    |   |                         |   |                    |                                              |   |
| 3                                                                                                                                                  | Category | Humanities & Social Studies (HS)                                                       | Basic Sciences & Maths (BS) |                                                | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |
|                                                                                                                                                    |          |                                                                                        | √                           |                                                |                    |                        |                    |   |                         |   |                    |                                              |   |
| 4                                                                                                                                                  | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016                         |                             |                                                |                    |                        |                    |   |                         |   |                    |                                              |   |

### UNIT 1 PARTIAL DIFFERENTIAL EQUATIONS

9+6

Formation – Solution of Standard types of first order equations – Lagrange's equation – Linear partial differential equations of second and higher order with constant coefficients

### UNIT II FOURIER SERIES

9+6

Dirichlet's conditions – General Fourier series- Half range sine and cosine series – Parse Val's identity – Harmonic analysis

### UNIT III BOUNDARY VALUE PROBLEMS

9+6

Classification of second order linear partial differential equations – solution of one – dimensional wave equations, one dimensional heat equations.

**UNIT IV LAPLACE TRANSFORMS****9+6**

Transforms of simple functions – basic operational properties – transforms of derivatives and integrals – initial and final value theorems – inverse transforms – convolution theorem – periodic functions – applications of Laplace transforms for solving linear ordinary differential equation up to second order with constant coefficients and simultaneous equations of first order with constant coefficients.

**UNIT V FOURIER TRANSFORMS****9+6**

Statement of Fourier integral theorem – Fourier transform pairs – Fourier sine and cosine transforms – properties – transforms of simple functions – convolution theorem – Parse Val's identity

**TEXT BOOKS:**

1. Kandasamy, P., Thilakavathy, K. and Gunavathy.K. "Engineering Mathematics ", Vol II& III (4<sup>th</sup> revised edition ) S Chand and co. , New Delhi, 2001.
2. Narayanan.S , Manicavachangam pillay ,T.K., Ramanaiah, G. "Advanced Mathematicsfor Engineering Students " Vol II & III (2<sup>nd</sup> Edition), S.Viswanathan (Printers and Publishers Pvt Ltd) 1992.
3. Venkatraman, M.K. "Engineering Mathematics" Vol III – A&B , 13<sup>th</sup>Edition National Publishing Company , Chennai 2002

|                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                    |  |   |   |   |   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--|---|---|---|---|
| BCE301                                                                                                                                                                                                                                                                                                                                                                                                      | APPLIED MECHANICS                                                                                                  |  | L | T | P | C |
|                                                                                                                                                                                                                                                                                                                                                                                                             | Total Contact Hours - 60                                                                                           |  | 4 | 0 | 0 | 4 |
|                                                                                                                                                                                                                                                                                                                                                                                                             | Prerequisite – Engineering Mechanics                                                                               |  |   |   |   |   |
|                                                                                                                                                                                                                                                                                                                                                                                                             | Course Designed by – Dept of Civil Engineering                                                                     |  |   |   |   |   |
| <b>OBJECTIVES</b><br>1. To learn fundamental concepts of Stress, Strain and deformation of solids with applications to bars, beams and thin cylinders.<br>2. To know the mechanism of load transfer in beams, the induced stress resultants and deformations.<br>3. To understand the effect of torsion on shafts and springs.<br>4. To analyze a complex two dimensional state of stress and plane trusses |                                                                                                                    |  |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    |  |   |   |   |   |
| CO1                                                                                                                                                                                                                                                                                                                                                                                                         | To apply the fundamental concepts of stress and strain in the design of various structural components and machines |  |   |   |   |   |
| CO2                                                                                                                                                                                                                                                                                                                                                                                                         | To analyze and design shafts to transmit required power                                                            |  |   |   |   |   |
| CO3                                                                                                                                                                                                                                                                                                                                                                                                         | To analyze about the force in member Truss with different methods                                                  |  |   |   |   |   |
| CO4                                                                                                                                                                                                                                                                                                                                                                                                         | To determine the bending, shear stresses and deflection produced in a beam subjected to system of loads            |  |   |   |   |   |
| CO5                                                                                                                                                                                                                                                                                                                                                                                                         | To determine stresses due to impact and suddenly applied loads                                                     |  |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                                                                                                                                                                                                                                                                 |                                                                                                                    |  |   |   |   |   |

|   |          |                                                                |   |                             |   |                    |                        |   |                    |                         |                    |                                             |   |
|---|----------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|---|--------------------|-------------------------|--------------------|---------------------------------------------|---|
| 1 | COs/POs  | a                                                              | b | c                           | d | e                  | f                      | g | h                  | i                       | j                  | k                                           | l |
| 2 | CO1      | H                                                              |   | M                           | M |                    |                        |   |                    | L                       |                    |                                             |   |
|   | CO2      | H                                                              | M | M                           | M | H                  |                        |   |                    | L                       |                    |                                             |   |
|   | CO3      | H                                                              | M | M                           | M |                    |                        |   |                    | L                       |                    |                                             |   |
|   | CO4      | H                                                              |   | M                           | M |                    |                        |   |                    | L                       |                    |                                             |   |
|   | CO5      | H                                                              |   | M                           | M | H                  |                        |   |                    | L                       |                    |                                             |   |
| 3 | Category | Humanities & Social Studies                                    |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) |   | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/Seminar/ Internship (PR) |   |
|   |          |                                                                |   |                             |   |                    | √                      |   |                    |                         |                    |                                             |   |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |                        |   |                    |                         |                    |                                             |   |

### UNIT I SIMPLE STRESSES AND STRAINS

12

Tension, compression and shear stress - Hook's law - simple problems - compound bars - Relationship between elastic constants - Thermal stresses.

### UNIT II PRINCIPAL STRESSES & TORSION

12

Combined stresses – Principles stress and principal planes – Mohr's circle - stresses in thin cylinders and shells. Theory of torsion – Strain energy in torsion – Torsion of circular shafts – shear stresses due to torsion of Closed and Open coiled helical springs.

### UNIT III ANALYSIS OF PLANE TRUSSES

12

Stability and Equilibrium of plane frames, Perfect Frames, Types of trusses – Analysis of forces in truss members - Method of joints – Methods of sections – Tension coefficient method – Graphical method.

### UNIT IV BEAMS & BENDING

12

Beams and support conditions - Types of supports - Shear force and bending moment – Dynamics for simply supported beams, cantilevers and overhanging beams with concentrated and / distributed loads. Theory of simple bending – bending stress distribution – shear stress distribution - leaf springs.

### UNIT V STRAIN ENERGY

12

Strain energy due to axial force, bending moment, flexural and torsional shear – Resilience stresses due to impact and suddenly applied loads.

#### TEXT BOOKS:

1. Ramamurtham S & Narayanan R, Strength of Materials , Dhanpat Rai Publication 2008
2. Bansal R.K, Engineering Mechanics and Strength of Materials, Laxmi Publications (P) Ltd. New Delhi 2010

#### REFERENCE:

1. Egor P, Popov, Introduction of Mechanics of Solids, 1998.
2. Ryder G.H. Strength of Materials, Macmillan India, 2002.
3. Khurmi R.S, A Text Book of Engineering Mechanics S.Chand & Co, 2012.

4. Srinath L S, Advanced Mechanics of Solids, Tata McGraw Hill Co, 2009.
5. Jain O.P. & Jain B.K, Theory and Analysis of Structures Vol I & II 2012, 2011

|                                                                                                                             |          |                                                                                                                                        |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
|-----------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|---|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
| BCE302                                                                                                                      |          | SURVEYING – I                                                                                                                          |   |                             |   |                    |                        |   |                    | L | T                       | P | C                  |                                              |
|                                                                                                                             |          | Total Contact Hours - 45                                                                                                               |   |                             |   |                    |                        |   |                    | 3 | 0                       | 0 | 3                  |                                              |
|                                                                                                                             |          | Prerequisite – Basic Civil and Mechanical Engineering                                                                                  |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                             |          | Course Designed by – Dept of Civil Engineering                                                                                         |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| OBJECTIVES: To introduce the principles of various surveying methods and applications to Civil Engineering projects.        |          |                                                                                                                                        |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| COURSE OUTCOMES (COs)                                                                                                       |          |                                                                                                                                        |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO1                                                                                                                         |          | Carry out preliminary surveying in the field of civil engineering applications                                                         |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO2                                                                                                                         |          | Plan a survey, taking accurate measurements, field booking, plotting and adjustment of traverse using various conventional instruments |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO3                                                                                                                         |          | Plan a survey for applications such as road alignment and height of building.                                                          |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO4                                                                                                                         |          | Take horizontal and vertical angles precisely by an optical distance measurement using Theodolite.                                     |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO5                                                                                                                         |          | Set out curves, buildings, culverts and tunnels                                                                                        |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                                                                                        |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 1                                                                                                                           | COs/POs  | a                                                                                                                                      | B | c                           | d | e                  | f                      | g | h                  | i | j                       | k | l                  |                                              |
| 2                                                                                                                           | CO1      | H                                                                                                                                      | M |                             | M | H                  |                        |   |                    |   |                         |   | M                  |                                              |
|                                                                                                                             | CO2      |                                                                                                                                        | H |                             |   | M                  |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO3      | H                                                                                                                                      |   |                             |   | H                  |                        |   |                    |   |                         |   | H                  |                                              |
|                                                                                                                             | CO4      | H                                                                                                                                      |   |                             | M |                    |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO5      |                                                                                                                                        |   |                             |   | M                  |                        |   |                    |   |                         |   | H                  |                                              |
| 3                                                                                                                           | Category | Humanities & Social Studies (HS)                                                                                                       |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                             |          |                                                                                                                                        |   |                             |   |                    | √                      |   |                    |   |                         |   |                    |                                              |
| 4                                                                                                                           | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016                                                                         |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |

## **UNIT I INTRODUCTION AND CHAIN SURVEYING**

**9**

Definition – Principles – classification-field & office work-scales-conventional signs – survey instruments – care & adjustment – ranging & chaining – Reciprocal Ranging – setting perpendiculars – well- conditioned triangles – traversing – plotting – enlarging & reducing figures.

## **UNIT II COMPASS & PLANE TABLE SURVEYING**

**9**

Prismatic compass – Surveyors compass - bearing systems & conversions- local attraction-magnetic declination – Dip – Traversing – Plotting – adjustment – Plane table Surveying -

Methods of Radiation – intersection, Resection – traversing – Adjustments- Errors in plane tabling.

### UNIT III LEVELING APPLICATION

9

Level line-Horizontal line-levels & Staves – spirit level – sensitiveness-bench marks – temporary and permanent adjustments– fly & check leveling – Booking – reduction – Curvature and refraction reciprocal leveling – longitudinal and cross sectioning – plotting – calculation of areas and volumes – contouring – methods – characteristics – and uses of contours – plotting-earth work volume – capacity of reservoirs.

### UNIT IV THEODOLITE SURVEYS

9

Theodolite - vernier and microptic -description and uses – temporary and permanent adjustments of vernier transit – Horizontal angles – vertical angles – closing error and distribution – Gale's table- Omitted measurement

### UNIT V ENGINEERING SURVEYS

9

Reconnaissance-preliminary and location surveys for Engineering Projects – Layout – Setting out work- Route surveys for highways, railways and water ways – curve ranging – Horizontal and vertical curves – Simple Curves – setting with chain and tapes, tangential angles by theodolite, double theodolite-compound and reverse curves - Transition curves-functions and requirements-sight distances- mine surveying- instruments – tunnels correlation of underground and surface surveys .

#### TEXT BOOKS:

1. Punmia B.C."Surveying" Vols I and II & III Laxmi Publications, 1999.

#### REFERENCE:

1. Kanekar T.P."Surveying and Levelling" Vols. I and II, united book corporation, Pune, 1994.
2. Chandra A.M, "Plane Surveying and Higher Surveying", New Age International (P)
3. Limited, Publishers, Chennai, 2002.
4. Heribert Kahmen and wolfgang Faig "surveying" Walter de Gruyter, 1995
5. Bannister A and Raymonds. "Surveying" ELBS. Sixth Edition, 1992.

|                                                                                                                                 |                                                       |          |          |          |          |
|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|----------|----------|----------|----------|
| <b>BCE303</b>                                                                                                                   | <b>BUILDING CONSTRUCTION</b>                          | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                                                 | Total Contact Hours - 45                              | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |
|                                                                                                                                 | Prerequisite – Basic Civil and Mechanical Engineering |          |          |          |          |
|                                                                                                                                 | Course Designed by – Dept of Civil Engineering        |          |          |          |          |
| <b>OBJECTIVES</b>                                                                                                               |                                                       |          |          |          |          |
| 1. To introduce students to various materials and methods commonly used in civil engineering construction and their properties. |                                                       |          |          |          |          |
| 2. To give a detailed explanation of the tests performed on the fresh concrete and the hardened concrete.                       |                                                       |          |          |          |          |
| 3. To give a vision of the basics to be followed in the construction site .                                                     |                                                       |          |          |          |          |

| COURSE OUTCOMES (COs)                                                                                                       |          |                                                                              |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                             |
|-----------------------------------------------------------------------------------------------------------------------------|----------|------------------------------------------------------------------------------|-----------------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|---------------------------------------------|
| CO1                                                                                                                         |          | To learn about the different manufacturing process of the cement             |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                             |
| CO2                                                                                                                         |          | To know the types of the paint, Plastering, GFRP and geotextile              |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                             |
| CO3                                                                                                                         |          | To have a clear understanding about foundation and its type, Plate load test |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                             |
| CO4                                                                                                                         |          | About Water supplying, and drainage in the construction site                 |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                             |
| CO5                                                                                                                         |          | To know about Thermal insulation, water proofing, sound acoustic treatments  |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                             |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                              |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                             |
| 1                                                                                                                           | COs/POs  | a                                                                            | b                           | c | d                  | e | f                      | g | h                  | i | j                       | k | l                  |                                             |
| 2                                                                                                                           | CO1      |                                                                              | M                           |   | H                  | M | M                      |   | M                  | M | M                       |   |                    |                                             |
|                                                                                                                             | CO2      | H                                                                            |                             | M | H                  | M | M                      |   |                    | M |                         |   |                    |                                             |
|                                                                                                                             | CO3      | H                                                                            |                             | H | M                  | M |                        |   | M                  | H | M                       |   |                    |                                             |
|                                                                                                                             | CO4      | L                                                                            | M                           |   |                    | L |                        |   |                    |   |                         |   |                    |                                             |
|                                                                                                                             | CO5      | M                                                                            |                             | H | L                  | M |                        |   | L                  | L | L                       |   |                    |                                             |
| 3                                                                                                                           | Category | Humanities & Social Studies (HS)                                             | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) |   | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/Seminar/ Internship (PR) |
|                                                                                                                             |          |                                                                              |                             |   |                    |   | √                      |   |                    |   |                         |   |                    |                                             |
| 4                                                                                                                           | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016               |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                             |

## **UNIT I CEMENT & CONCRETE**

**9**

Manufacture of cement – Hydration of cement – Test on coarse and fine aggregates tests on cement, types of cement, tests on fresh & hardened concrete.

## **UNIT II PRESERVATIVES & SPECIAL MATERIALS**

**9**

Plastering - types – Paints – varnishes – distempers – wall cladding. Polymers (PVC Sheets, Pipes GFRP) ceramics & Clay Products - Refractory – Special Concrete - FRC, ferrocement & polymeric concrete – geotextiles.

## **UNIT III SUBSTRUCTURES & FOUNDATION**

**9**

Soil Exploration - investigation report. Plate load test – Bearing Capacity of Soil – Improving the bearing Capacity – Types of Foundations – raft Foundation – pile, Pier & caisson- basements – diaphragm walls.

## **UNIT IV BUILDING SERVICES - I**

**9**

Electric Wiring – Water Supply – Drainage- Air Conditioning – Ventilation – ramps, Escalators, Lifts, Stairs.

## **UNIT V BUILDING SERVICES II**

**9**

Water Proofing - Thermal Insulation - Termite proofing - Acoustic Treatment (Sound Conditioning) - Fire Protection - Intelligent Buildings

## **TEXT BOOKS:**

1. Arora S.P. and Bindra S.P. "Building Construction, Planning Techniques and Materials of Construction". Dhanapat Rai and Sons.

#### REFERENCE:

1. Chudley R "Construction Technology", (Vol.I,II,III,&IV) ELBS / Longman (2<sup>nd</sup> Edition).
2. Jha J and Sinha S.K. "Construction and Foundation Engineering" Khanna Publishers, 1993.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                             |   |   |   |   |   |   |   |   |   |   |   |   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| BCE304                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | FLUID MECHANICS                                                                             |   |   |   |   |   | L | T | P | C |   |   |   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Total Contact Hours - 45                                                                    |   |   |   |   |   | 3 | 0 | 0 | 3 |   |   |   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Prerequisite – Engineering Mechanics                                                        |   |   |   |   |   |   |   |   |   |   |   |   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Course Designed by – Dept of Civil Engineering                                              |   |   |   |   |   |   |   |   |   |   |   |   |
| OBJECTIVES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                             |   |   |   |   |   |   |   |   |   |   |   |   |
| <div>1. To understand the basic properties of the fluid, fluid kinematics, fluid dynamics and to analyze and appreciate the complexities involved in solving the fluid flow problems.</div> <div>2. To introduce the basics of hydrostatic forces involved in fluid mechanics and also to acquaint the students to learn about the theorems on Pascal’s law and buoyancy</div> <div>3. To understand the various types of fluid flow and to practice the problems based on Bernoullis equations and its applications</div> <div>4. To provide basic ideas on the boundary layer theorem and its classification along with problems underlying the subjects.</div> <div>5. To develops similitude and model studies for the basics of fluid mechanics with buckingham pi theorem as the basic concept.</div> |                                                                                             |   |   |   |   |   |   |   |   |   |   |   |   |
| COURSE OUTCOMES (COs)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                             |   |   |   |   |   |   |   |   |   |   |   |   |
| CO1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | To learn about the basics of fluid mechanics and various properties of fluids               |   |   |   |   |   |   |   |   |   |   |   |   |
| CO2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | To learn about the various forces on plane and curved surfaces and the concepts of buoyancy |   |   |   |   |   |   |   |   |   |   |   |   |
| CO3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | To have a clear understanding about fluid kinematics and dynamics                           |   |   |   |   |   |   |   |   |   |   |   |   |
| CO4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | To study the basics of boundary layer flow and flow through pipes                           |   |   |   |   |   |   |   |   |   |   |   |   |
| CO5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | To study about various models like distorted models and various dimensionless numbers       |   |   |   |   |   |   |   |   |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                             |   |   |   |   |   |   |   |   |   |   |   |   |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | COs/POs                                                                                     | a | b | c | d | e | f | g | h | i | j | k | l |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | CO1                                                                                         | H |   |   | M |   |   |   |   |   | L |   |   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | CO2                                                                                         |   |   |   |   |   | H |   | L |   |   | M |   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | CO3                                                                                         |   |   |   | H |   |   |   |   | M |   |   |   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | CO4                                                                                         |   |   |   |   |   | M |   |   | H | L |   |   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | CO5                                                                                         |   |   |   |   | M |   |   |   |   |   |   |   |

|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                               |
|---|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|-----------------------------------------------|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/ Term Paper/ Seminar/ Internship (PR) |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                               |

### UNIT I DEFINITIONS & FLUID PROPERTIES

9

Definitions – Fluid and Fluid Mechanics – Dimensions and units – Fluid properties continuum Concept of system and control volume.

### UNIT II FLUID STATICS

9

Pascal's law and hydrostatic equation – Forces on plane and curved surfaces – Buoyancy- Pressure measurement.

### UNIT III FLUID DYNAMICS & KINEMATICS

9

Fluid Kinematics - Stream, streak and path lines, Classification of flows-continuity equation, Stream and Potential functions, Flow nets, Velocity measurement. Euler and Bernoulli's equations- Application of Bernoulli's equation-Discharge measurement-laminar flows through pipes and between plates – Hagen Poiseuille equation – Turbulent flow, Darcy-Weisbach formula - moody Diagram – Momentum Principle- Impact of jets on plane and curved plates.

### UNIT IV BOUNDARY LAYER AND FLOW THROUGH PIPES

9

Definition of boundary layer – Thickness and classification - Displacement and momentum thickness. Development of laminar and Turbulent flows in circular pipes, Major and Minor losses of Flow in Pipes in series and in parallel pipe network.

### UNIT V SIMILITUDE AND MODEL STUDY

9

Dimensional analysis – Rayleigh's method – Buckingham PI-Theorem- Similitude and Models – Scale effect and distorted models.

#### TEXT BOOKS:

1. Kumar K.L "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd., New Delhi.

#### REFERENCES :

1. Streeter, Victor, L, and Benjamin., "Fluid Mechanics", McGraw-Hill Ltd., 1998
2. Natarajan M.K. "Principles of Fluid Mechanics", Agencies, Vidyal Karuppur, Kumbakonam, 1995.
3. Fox Robert W. and McDonald. Man T., Introduction Fluid Mechanics", John Wiley & Sons, 1995.

|               |                                  |          |          |          |          |
|---------------|----------------------------------|----------|----------|----------|----------|
| <b>BCE305</b> | <b>ENGINEERING EARTH SCIENCE</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|               | Total Contact Hours – 45         | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |
|               | Prerequisite – +2 level science  |          |          |          |          |

|                                                                                                                                                                                                                                                                                                |          |                                                                                                                                                         |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---|--------------------|------------------------|---|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
|                                                                                                                                                                                                                                                                                                |          | Course Designed by – Dept of Civil Engineering                                                                                                          |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| <b>OBJECTIVES</b>                                                                                                                                                                                                                                                                              |          |                                                                                                                                                         |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 1. To understand the importance of geological knowledge such as earth, earthquake and to apply this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor as well as to choose types of foundations.                                                                 |          |                                                                                                                                                         |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 2. An ability to function on multi-disciplinary teams.                                                                                                                                                                                                                                         |          |                                                                                                                                                         |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 3. Graduates will be capable of utilizing their backgrounds in engineering and earth science to provide solutions to engineering problems within the context of the natural world.                                                                                                             |          |                                                                                                                                                         |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 4. Areas of geological engineering practice might include fluid flow and contaminant transport in the subsurface; geo-mechanics (i.e., the behavior of earth materials), geo-engineering (i.e., design with earth materials); and discovery, development, and utilization of energy resources. |          |                                                                                                                                                         |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                                                                                                                                   |          |                                                                                                                                                         |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO1                                                                                                                                                                                                                                                                                            |          | To understand the role of geology in the design and construction process of underground openings in rock                                                |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO2                                                                                                                                                                                                                                                                                            |          | Be able to apply geologic concepts and approaches on rock engineering projects.                                                                         |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO3                                                                                                                                                                                                                                                                                            |          | Be able to identify and classify rock using basic geologic classification systems.                                                                      |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO4                                                                                                                                                                                                                                                                                            |          | Be able to use the geologic literature to establish the geotechnical framework needed to properly design and construct heavy civil works rock projects. |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO5                                                                                                                                                                                                                                                                                            |          | To assign projects which test student knowledge and application of intact rock and rock mass properties in geotechnical engineering                     |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                                                                                                                                                    |          |                                                                                                                                                         |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 1                                                                                                                                                                                                                                                                                              | COs/POs  | a                                                                                                                                                       | b                           | c | d                  | e                      | f | g                  | h | i                       | j | k                  | l                                            |
| 2                                                                                                                                                                                                                                                                                              | CO1      | H                                                                                                                                                       |                             |   | H                  |                        | H | H                  |   | M                       |   |                    |                                              |
|                                                                                                                                                                                                                                                                                                | CO2      | H                                                                                                                                                       |                             |   | H                  |                        | H | H                  |   | M                       |   |                    |                                              |
|                                                                                                                                                                                                                                                                                                | CO3      | H                                                                                                                                                       |                             |   | H                  |                        | H | H                  |   | M                       |   |                    |                                              |
|                                                                                                                                                                                                                                                                                                | CO4      | H                                                                                                                                                       |                             |   | H                  |                        | H | H                  |   | M                       |   |                    |                                              |
|                                                                                                                                                                                                                                                                                                | CO5      | H                                                                                                                                                       |                             |   | H                  |                        | H | H                  |   | M                       |   |                    |                                              |
| 3                                                                                                                                                                                                                                                                                              | Category | Humanities & Social Studies (HS)                                                                                                                        | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                                                                                                                                                                                                |          |                                                                                                                                                         |                             |   |                    | √                      |   |                    |   |                         |   |                    |                                              |
| 4                                                                                                                                                                                                                                                                                              | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016                                                                                          |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |

## UNIT I GENERAL GEOLOGY

9

Geology in Civil Engineering - Branches of geology - Earth Structure and Composition - Elementary knowledge on continental drift and plate tectonics. Earth processes - Weathering - Work of rivers, wind and sea and their engineering importance – origin, occurrence of earthquake- Mode of occurrence - prospecting –Ground water - Importance in civil engineering.

## UNIT II MINERALOGY

9

Elementary knowledge on symmetry elements of crystallographic systems - physical properties of minerals - study of the following rock forming minerals - Quartz family. Feldspar family, Augite, Hornblende, Biotite, Muscovite, Calcite, Garnet - properties, process of formation of all minerals - Coal and Petroleum - Their origin and occurrence in India.

### **UNIT III PETROLOGY**

**9**

Classification of rocks - Distinction between Igneous, Sedimentary and Metamorphic rocks. Description – occurrence, properties and distribution of following rocks. Igneous rocks - Granite, Syenite, Diorite, Gabbro, Pegmatite, Dolerite and Basalt. Sedimentary rocks - sandstone, Limestone, Shale, Conglomerate and breccia. Metamorphic rocks - Quartzite, Marble, Slate, Gneiss and Schist.

### **UNIT IV STRUCTURAL GEOLOGY AND ROCK MECHANICS**

**9**

Attitude of beds - Outcrops - Geological maps - study of structures - Folds, Faults and Joints - Their bearing on Engineering Construction -Rock mechanics - physical properties and mechanical properties of rocks – porosity – permeability - density – strength – hardness – elasticity – plasticity - dynamic property of rocks - types of wave theory – factors influencing wave velocity - static and dynamics moduli of elasticity – grouting.

### **UNIT V GEOLOGICAL AND GEOPHYSICAL INVESTIGATION IN CIVIL ENGINEERING**

**9**

Site investigations - Geological methods - Exploration techniques - geophysical methods – Seismic and electrical methods – direct penetration – core boring – logging of cores – geological condition necessary for construction of dams – tunnels – building – Road cutting.

#### **TEXT BOOKS:**

1. Parbin Singh, "Engineering and General Geology ", Katson Publication House.
2. P. C. Varghese, "Engineering Geology for Civil Engineers". PHI Learning Pvt. Ltd.,

#### **REFERENCES:**

1. Legeet, " Geology and Engineering ", McGraw Hill Book Company, 1998.
2. Blyth, " Geology for Engineers ", ELBS, 1995.

|                                                                                               |                                                                                       |  |          |          |          |          |
|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--|----------|----------|----------|----------|
| <b>BCE3L1</b>                                                                                 | <b>SURVEYING PRACTICAL – 1</b>                                                        |  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                               | Total Contact Hours - 45                                                              |  | <b>0</b> | <b>0</b> | <b>3</b> | <b>2</b> |
|                                                                                               | Prerequisite – Survey I                                                               |  |          |          |          |          |
|                                                                                               | Course Designed by – Dept of Civil Engineering                                        |  |          |          |          |          |
| <b>OBJECTIVES:</b> To understand and posses the knowledge about field techniques in Surveying |                                                                                       |  |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                  |                                                                                       |  |          |          |          |          |
| CO1                                                                                           | To know how to do chain surveying, ranging and its importance                         |  |          |          |          |          |
| CO2                                                                                           | Study about types of compass, local attractions and its errors                        |  |          |          |          |          |
| CO3                                                                                           | To study plane table surveying and its various methods of finding inaccessible points |  |          |          |          |          |
| CO4                                                                                           | To study about leveling and its types, LS and CS sections of alignment                |  |          |          |          |          |

| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |
|-----------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------|-----------------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
| 1                                                                                                                           | COs/POs  | a                                                              | b                           | c | d                  | e | f                      | g | h                  | i | j                       | k | l                  |                                              |
| 2                                                                                                                           | CO1      | M                                                              | H                           | M |                    |   |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO2      | M                                                              | H                           | M |                    |   |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO3      | M                                                              | H                           | M |                    |   |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO4      | M                                                              | H                           | M |                    |   |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO5      | M                                                              | H                           | M |                    |   |                        |   |                    |   |                         |   |                    |                                              |
| 3                                                                                                                           | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) |   | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PP) |
|                                                                                                                             |          |                                                                |                             |   |                    |   | √                      |   |                    |   |                         |   |                    |                                              |
| 4                                                                                                                           | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |

### LIST OF EXPERIMENTS

1. a) Simple chain survey - problems involving instruments such as optical and prism Square - cross staff.
- b) Overcoming obstacles in chaining and ranging.
2. a) Measurement of bearing of survey lines by prismatic compass.
- b) Running closed and open compass traverse.
- c) Plotting and Adjustments of traverse.
3. a) Plane table survey of building or a park or a road by different methods.
- b) Field solution of two and three point problems.
4. Problems in leveling.

|                                                                                                                                                            |                                                                   |          |          |          |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|----------|----------|----------|----------|
| <b>BCE3L1</b>                                                                                                                                              | <b>STRENGTH OF MATERIALS LAB</b>                                  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                                                                            | Total Contact Hours - 45                                          | <b>0</b> | <b>0</b> | <b>3</b> | <b>2</b> |
|                                                                                                                                                            | Prerequisite – Engineering Mechanics                              |          |          |          |          |
|                                                                                                                                                            | Course Designed by – Dept of Civil Engineering                    |          |          |          |          |
| <b>OBJECTIVES</b>                                                                                                                                          |                                                                   |          |          |          |          |
| To expose the students to the testing of different materials under the action of various forces and determination of their characteristics experimentally. |                                                                   |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                               |                                                                   |          |          |          |          |
| CO1                                                                                                                                                        | To study the failure due to tensile force subjected to a material |          |          |          |          |
| CO2                                                                                                                                                        | To study the failure due to shear force subjected to a material   |          |          |          |          |
| CO3                                                                                                                                                        | To study hardness properties of materials and its types           |          |          |          |          |
| CO4                                                                                                                                                        | To study impact intensity of materials and its properties         |          |          |          |          |
| CO5                                                                                                                                                        | To study ductility properties of materials                        |          |          |          |          |
| CO6                                                                                                                                                        | To study fatigue properties of materials                          |          |          |          |          |

|                                                                                                                             |                                                     |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|---|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
| CO7                                                                                                                         | To study the deflections in springs                 |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO8                                                                                                                         | To study the behavior of different types of columns |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                     |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 1                                                                                                                           | COs/POs                                             | a                                                              | b | c                           | d | e                  | f                      | g | h                  | i | j                       | k | l                  |                                              |
| 2                                                                                                                           | CO1                                                 | M                                                              | H |                             |   | M                  |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO2                                                 | M                                                              | H |                             |   | M                  |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO3                                                 | M                                                              | H |                             |   | M                  |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO4                                                 | M                                                              | H |                             |   | M                  |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO5                                                 | M                                                              | H |                             |   | M                  |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO6                                                 | M                                                              | H |                             |   | M                  |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO7                                                 | M                                                              | H |                             |   | M                  |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO8                                                 | M                                                              | H |                             |   | M                  |                        |   |                    |   |                         |   |                    |                                              |
| 3                                                                                                                           | Category                                            | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                             |                                                     |                                                                |   |                             |   |                    | √                      |   |                    |   |                         |   |                    |                                              |
| 4                                                                                                                           | Approval                                            | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |

## LIST OF EXPERIMENTS

### I. TESTS ON STEEL

1. Tension Test to find yield stress, ultimate stress, nominal and actual breaking stress and % age elongation and reduction in area of cross section, work done in breaking the specimen and calculation of Young's modulus using different extensometers (test on mild steel, High tensile steel Rods & flats).
2. Shear test: Double Shear
3. Hardness test Vicket, Brunell, and Rockwell.
4. Impact Test using Charpy and Izod Testing machines
5. Cold Bend Test
6. Ductility Test: sheet Ductility, Reverse bending on works.
7. Fatigue Test.

### II TESTS ON TIMBER:

Compression test both parallel and perpendicular to the grains, deflection

### III OTHER TESTS:

1. Springs: Leaf spring and helical spring
2. Columns: Long and short columns
3. Beams: Steel and timber beams with different cross sections of different and conditions (simply supported, cantilever, propped, continuous) Test under elastic and Ultimate stages.

### REFERENCES:

1. Davis H.E. Trophell.G.E & Hanck, G.F.W. , The Testing Of Engineering Materials – McGrew Hill, International Book Co.

2. Timoshenko S.P, &Young, D.H. Strength of Materials – East West Press Ltd.
3. Relevant 813 code. Venon john, Engineering Materials, 3rt Edition, McMillan Co.Ltd.,

|                                                                                                                                                                                                        |                                                                                                                             |                                                                |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|---|--------------------|---|------------------------|----------|--------------------|----------|-------------------------|---|--------------------|--|--------------------------------------------|
| <b>BMA402</b>                                                                                                                                                                                          |                                                                                                                             | <b>NUMERICAL METHODS</b>                                       |                             |   |                    |   |                        | <b>L</b> | <b>T</b>           | <b>P</b> | <b>C</b>                |   |                    |  |                                            |
|                                                                                                                                                                                                        |                                                                                                                             | Total Contact Hours - 75                                       |                             |   |                    |   |                        | <b>3</b> | <b>2</b>           | <b>0</b> | <b>4</b>                |   |                    |  |                                            |
|                                                                                                                                                                                                        |                                                                                                                             | Prerequisite – Maths I, II & III                               |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |                                            |
|                                                                                                                                                                                                        |                                                                                                                             | Course Designed by – Dept of English                           |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |                                            |
| <b>OBJECTIVES</b>                                                                                                                                                                                      |                                                                                                                             |                                                                |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |                                            |
| This course aims at providing the necessary basic concepts of a few numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology. |                                                                                                                             |                                                                |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |                                            |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                                           |                                                                                                                             |                                                                |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |                                            |
| CO1                                                                                                                                                                                                    | Have a fundamental knowledge of the basic solutions of equations and eigen value problems                                   |                                                                |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |                                            |
| CO2                                                                                                                                                                                                    | Have a well-founded knowledge of standard numerical differentiation and integration which can describe real life phenomena. |                                                                |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |                                            |
| CO3                                                                                                                                                                                                    | Acquire skills in handling situations involving first and second order differential equations                               |                                                                |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |                                            |
| CO4                                                                                                                                                                                                    | Understand boundary value problems on ordinary and partial differential equations                                           |                                                                |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |                                            |
| CO5                                                                                                                                                                                                    | Be able to analyze the interpolation techniques.                                                                            |                                                                |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |                                            |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                                                            |                                                                                                                             |                                                                |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |                                            |
| 1                                                                                                                                                                                                      | COs/POs                                                                                                                     | a                                                              | b                           | c | d                  | e | f                      | g        | h                  | i        | j                       | k | l                  |  |                                            |
| 2                                                                                                                                                                                                      | CO1                                                                                                                         | H                                                              |                             |   | M                  | H |                        | H        |                    |          | M                       |   |                    |  |                                            |
|                                                                                                                                                                                                        | CO2                                                                                                                         |                                                                |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |                                            |
|                                                                                                                                                                                                        | CO3                                                                                                                         | M                                                              |                             |   | H                  |   |                        |          |                    |          | M                       |   |                    |  |                                            |
|                                                                                                                                                                                                        | CO4                                                                                                                         | H                                                              |                             |   |                    | H |                        | H        |                    |          |                         |   |                    |  |                                            |
|                                                                                                                                                                                                        | CO5                                                                                                                         | H                                                              |                             |   | H                  |   |                        |          |                    |          | H                       |   |                    |  |                                            |
| 3                                                                                                                                                                                                      | Category                                                                                                                    | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) |   | Professional Core (PC) |          | Core Elective (CE) |          | Non-Major Elective (NE) |   | Open Elective (OE) |  | Project/Term Paper/Seminar/Internship (PR) |
|                                                                                                                                                                                                        |                                                                                                                             |                                                                | √                           |   |                    |   |                        |          |                    |          |                         |   |                    |  |                                            |
| 4                                                                                                                                                                                                      | Approval                                                                                                                    | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |                                            |

### **UNIT I SOLUTIONS OF EQUATIONS AND EIGEN VALUE PROBLEMS 9+6**

Iterative method Newton - Raphson method for single variable. Solutions of Linear system by Gaussian Gauss – Jordan, Jacobi and Gauss – Seidel methods, Inverse of a matrix by Gauss – Jordan method. Eigen value of a matrix by power and Jacobi methods.

### **UNIT II INTERPOLATION (FINITE DIFFERENCES) 9+6**

Newton's Divided Difference Formula – Lagrange's Interpolation Newton forward and backward difference formulae – Stirling's Bessel's central difference formulae.

**UNIT III      NUMERICAL DIFFERENTIATION AND INTEGRATION      9+6**

Numerical Differentiation with interpolation polynomials, Numerical integration by Trapezoidal Simpson's (Both  $1/3$ '' and  $3/8$ '' ) rules. Double Integrals using Trapezoidal and Simpson's rules.

**UNIT IV      INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS      9+6**

Single step methods – Taylors series, Euler's and Modified Euler, Runge – Kutta method of first and second order differential equations. Multiple step methods – Milne and Adam's – Bashforth predict and Corrected Method.

**UNIT V      BOUNDARY VALUE PROBLEMS FOR ODE AND PDE      9+6**

Finite difference for the second order ordinary differential equations. Finite difference solutions for one dimensional heat Equations. Finite difference solutions for one dimensional heat Equations(both implicit and Explicit) one dimensional wave equation and two dimensional Laplace and Poisson Equation.

**REFERENCES:**

1. Srinivasan, "Numerical Methods for Engineering" CBS Publishers.Chennai.1994.
2. Datta, "Numerical Methods for Linear Control Systems" CBS Publishers. Chennai 2005.
3. Yang, "Applied Numerical Methods Using MATLAB" CBS Publishers. Chennai 2005.

|                                                                                                                                                           |                                                                      |   |   |   |   |   |   |          |          |          |          |   |   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|---|---|---|---|---|---|----------|----------|----------|----------|---|---|
| <b>BCE401</b>                                                                                                                                             | <b>THEORY OF STRUCTURES</b>                                          |   |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |
|                                                                                                                                                           | Total Contact Hours - 60                                             |   |   |   |   |   |   | <b>4</b> | <b>0</b> | <b>0</b> | <b>4</b> |   |   |
|                                                                                                                                                           | Prerequisite -Basic Structural Design                                |   |   |   |   |   |   |          |          |          |          |   |   |
|                                                                                                                                                           | Course Designed by – Dept of Civil Engineering                       |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>OBJECTIVES</b>                                                                                                                                         |                                                                      |   |   |   |   |   |   |          |          |          |          |   |   |
| 1. To know the method of finding slope and deflection of beams and trusses using energy theorems and to know the concept of analysing indeterminate beam. |                                                                      |   |   |   |   |   |   |          |          |          |          |   |   |
| 2. To estimate the load carrying capacity of columns, stresses due to unsymmetrical bending and various theories for failure of material.                 |                                                                      |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                              |                                                                      |   |   |   |   |   |   |          |          |          |          |   |   |
| CO1                                                                                                                                                       | To find the deflection in beams and frames using Energy theorems.    |   |   |   |   |   |   |          |          |          |          |   |   |
| CO2                                                                                                                                                       | To analyze indeterminate beams like continuous beams and fixed beams |   |   |   |   |   |   |          |          |          |          |   |   |
| CO3                                                                                                                                                       | To analyze the long and short columns and determine the design loads |   |   |   |   |   |   |          |          |          |          |   |   |
| CO4                                                                                                                                                       | To assess the state of stress in three dimensions                    |   |   |   |   |   |   |          |          |          |          |   |   |
| CO5                                                                                                                                                       | To solve problems involving unsymmetrical bending structural members |   |   |   |   |   |   |          |          |          |          |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                               |                                                                      |   |   |   |   |   |   |          |          |          |          |   |   |
| 1                                                                                                                                                         | COs/POs                                                              | a | b | c | d | e | f | g        | h        | i        | j        | k | l |
| 2                                                                                                                                                         | CO1                                                                  | H |   | H | M |   |   |          |          |          |          |   |   |
|                                                                                                                                                           | CO2                                                                  | M |   | H | M |   |   |          |          |          |          |   |   |

|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                              |  |  |  |  |
|---|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|----------------------------------------------|--|--|--|--|
|   | CO3      | M                                                              |                             | H                  | M                      |                    |                         |                    |                                              |  |  |  |  |
|   | CO4      | H                                                              |                             | H                  | M                      |                    |                         |                    |                                              |  |  |  |  |
|   | CO5      | H                                                              |                             | H                  | M                      |                    |                         |                    |                                              |  |  |  |  |
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |  |  |  |  |
|   |          |                                                                |                             |                    | √                      |                    |                         |                    |                                              |  |  |  |  |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                              |  |  |  |  |

### UNIT I ENERGY THEOREM

12

**Conservative and non-conservative systems** – Strain energy and complimentary energy – Principle of virtual displacement and virtual forces, **castigliano's first theorem, Engesser's theorem, castigliano's second theorem, Maxwell's theorem**

### UNIT I IDEFLECTION OF BEAM

12

Determination of deflection and slope – **Double integration method** – Macaulay's method-Area moment method-conjugate beam method, **strain energy and dummy unit load approaches.**

### UNIT III STATICALLY INDETERMINATE BEAMS

12

Axially load members - composite bars – Beams: **Propped, fixed and continuous beams** - Theorem of three moments-calculations of reactions, Bending Moment and Shear forces - **shear force and bending moment diagrams.**

### UNIT IV THEORY OF COLUMNS

12

Axial load - combined bending and axial – **Euler's formula for long struts-practical applications** – **Rankine's Gordon's formula** – **beam columns.**

### UNIT V THICK CYLINDERS

12

Lame's equation - shrink fit- **compound cylinders – wire wound cylinders.**

### DEFLECTION OF TRUSSES

Castigliano's Theorem, dummy unit load method, Williotmohr's diagram.

### TEXT BOOKS:

1. Gupta S.P, Pandit G.S, Gupta R. , Theory of Structures, Vol.I&II .Tata McGraw HillCo,1981

### REFERENCES:

1. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2003
2. Beer and Johnson. Mechanics of Materials, S.I Metric Edition, McGraw Hill Co, 2002
3. Punmia B.C.Theory of Structures (SMTS) Vol 1&II, Laxmi publishing Pvt Ltd, NewDelhi, 2004.
4. Jain O.P. and.Jain B.K., Theory and analysis of structures, Mechanics of Materials Nem Chand & Brothers, Roorkee, 2001

|                                                                                                                                                       |          |                                                                                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|---|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
| BCE402                                                                                                                                                |          | SURVEYING – II                                                                                                                 |   |                             |   |                    |                        |   |                    | L | T                       | P | C                  |                                              |
|                                                                                                                                                       |          | Total Contact Hours - 45                                                                                                       |   |                             |   |                    |                        |   |                    | 3 | 0                       | 0 | 3                  |                                              |
|                                                                                                                                                       |          | Prerequisite – Surveying I                                                                                                     |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                                                       |          | Course Designed by – Dept of Civil Engineering                                                                                 |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| OBJECTIVES                                                                                                                                            |          |                                                                                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| This subject deals with geodetic measurements and Control Survey methodology and its adjustments. The student is also exposed to the Modern Surveying |          |                                                                                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| COURSE OUTCOMES (COs)                                                                                                                                 |          |                                                                                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO1                                                                                                                                                   |          | Have the fundamental knowledge to measure both horizontal distance and elevations without the use of sophisticated instruments |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO2                                                                                                                                                   |          | Acquires knowledge aboutthe principle of control surveying                                                                     |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO3                                                                                                                                                   |          | Have knowledge on the survey errors and its adjustments                                                                        |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO4                                                                                                                                                   |          | Have knowledge in the advanced topics in astronomy.                                                                            |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO5                                                                                                                                                   |          | Have knowledge to modern methods of surveying like Photogrammetry, Total station, Hydrographic survey and cartography          |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                           |          |                                                                                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 1                                                                                                                                                     | COs/POs  | a                                                                                                                              | b | c                           | d | e                  | f                      | g | h                  | i | j                       | k | l                  |                                              |
| 2                                                                                                                                                     | CO1      | H                                                                                                                              |   |                             | M |                    |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                                                       | CO2      | H                                                                                                                              |   |                             |   | M                  |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                                                       | CO3      | H                                                                                                                              |   |                             | M |                    |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                                                       | CO4      | H                                                                                                                              | M | M                           | M |                    |                        |   |                    |   |                         | M |                    |                                              |
|                                                                                                                                                       | CO5      | H                                                                                                                              |   |                             | M |                    |                        |   |                    |   |                         | H |                    |                                              |
| 3                                                                                                                                                     | Category | Humanities & Social Studies (HS)                                                                                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                                                       |          |                                                                                                                                |   |                             |   |                    | √                      |   |                    |   |                         |   |                    |                                              |
| 4                                                                                                                                                     | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016                                                                 |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |

## UNIT I TACHEOMETRIC SURVEYING

6

**Tacheometric systems** - Tangential, stadia and subtense methods - Stadia systems - Horizontal and inclined sights - Vertical and normal staffing - **Fixed and movable hairs** - Stadia constants - **Anellactic lens – Subtense bar.**

## UNIT II CONTROL SURVEYING

8

Working from whole to part - **Horizontal and vertical control methods** - Triangulation - Signals - Base line - **Instruments and accessories** - Corrections - **Satellite station - Reduction to centre** - Trigonometric leveling – **Single and reciprocal observations** - Modern trends

**UNIT III SURVEY ADJUSTMENTS****8**

Errors - Sources, precautions and corrections - Classification of errors - True and most probable values - weighted observations - Method of Equal shifts - Principle of least squares - Normal equation - Correlates - Level nets - Adjustment of simple triangulation networks

**UNIT IV ASTRONOMICAL SURVEYING****11**

Celestial sphere - Astronomical terms and definitions - Motion of sun and stars - Apparent altitude and corrections - Celestial co-ordinate systems - Different time systems - Nautical almanac - Star constellations - Practical astronomy - Field observations and calculations for azimuth

**UNIT V MISCELLANEOUS****12**

Photogrammetry - Introduction - Terrestrial and aerial Photographs - Stereoscopy - Parallax - Electromagnetic distance measurement - Carrier waves - Principles - Instruments - Trilateration - Hydrographic Surveying - Tides - MSL - Location of soundings and methods - Three point problem - Study of Box - Sextants and station pointer - River surveys - Measurement of current and discharge - Cartography - Cartographic concepts and techniques - Cadastral surveying - Definition - Uses - Legal values - Scales and accuracies.

**TEXT BOOKS:**

1. Punmia B.C., " Surveying ", Vols. I, II and III, Laxmi Publications, 2005

**REFERENCES:**

1. Clark D., " Plane and Geodetic Surveying ", Vols. I and II, C.B.S. Publishers and Distributors, Delhi, sixth Edition, 1971.
2. James M. Anderson and Edward M. Mikhail, " Introduction to Surveying ", McGraw Hill Book Company, 1985.
3. Wolf P.R. " Elements of Photogrammetry", McGraw Hill Book Company, Second Edition, 1986.
4. Robinson A.H., Sale R.D. Morrison J.L. and Muehrcke P.C., " Elements of Cartography ", John Wiley and Sons, New York, Fifth Edition, 1984.
5. Heribert Kahmen and Wolfgang Faig, " Surveying ", Walter de Gruyter, 1995.
6. Kanetkar T.P., " Surveying and Levelling ", Vols. I and II, United Book Corporation, Pune, 1994.

|                                                                                                                                                                 |                                                |  |          |          |          |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|--|----------|----------|----------|----------|
| <b>BCE403</b>                                                                                                                                                   | <b>SOIL MECHANICS</b>                          |  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                                                                                 | Total Contact Hours - 45                       |  | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |
|                                                                                                                                                                 | Prerequisite – Engineering Mechanics           |  |          |          |          |          |
|                                                                                                                                                                 | Course Designed by – Dept of Civil Engineering |  |          |          |          |          |
| <b>OBJECTIVES</b>                                                                                                                                               |                                                |  |          |          |          |          |
| 1. To impart knowledge on behavior and the performance of saturated soil.                                                                                       |                                                |  |          |          |          |          |
| 2. To understand and access both physical and engineering behavior of soils, mechanism of stress transfer in two-phase systems and stability analysis of slopes |                                                |  |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                    |                                                |  |          |          |          |          |
| CO1                                                                                                                                                             | To carry out soil classification               |  |          |          |          |          |
| CO2                                                                                                                                                             | To solve three phase system problems           |  |          |          |          |          |

|                                                                                                                             |                                                                                                                          |                                                                |   |                            |   |                     |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|---|----------------------------|---|---------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|----------------------------------------------|--|
| CO3                                                                                                                         | Tosolve any practical problems related to soil stresses estimation, permeability and seepage including flow net diagram. |                                                                |   |                            |   |                     |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO4                                                                                                                         | To estimate the stresses under any system of foundation loads                                                            |                                                                |   |                            |   |                     |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO5                                                                                                                         | To solve practical problems related to consolidation settlement and time rate of settlement.                             |                                                                |   |                            |   |                     |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                                          |                                                                |   |                            |   |                     |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| 1                                                                                                                           | COs/POs                                                                                                                  | a                                                              | B | c                          | d | e                   | f | g                      | h | i                  | j | k                       | l |                    |  |                                              |  |
| 2                                                                                                                           | CO1                                                                                                                      |                                                                | M |                            | H |                     |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO2                                                                                                                      | H                                                              |   |                            | H | M                   |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO3                                                                                                                      |                                                                |   |                            | H |                     |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO4                                                                                                                      | M                                                              |   |                            | M |                     |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO5                                                                                                                      |                                                                | M |                            | H |                     |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| 3                                                                                                                           | Category                                                                                                                 | Humanities & Social Studies (HS)                               |   | Basic Sciences &Maths (BS) |   | Enggg Sciences (ES) |   | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) |  | Project/Term Paper/ Seminar/ Internship (PR) |  |
|                                                                                                                             |                                                                                                                          |                                                                |   |                            |   |                     | √ |                        |   |                    |   |                         |   |                    |  |                                              |  |
| 4                                                                                                                           | Approval                                                                                                                 | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                            |   |                     |   |                        |   |                    |   |                         |   |                    |  |                                              |  |

## UNIT I INTRODUCTION

10

Nature of soil - Soil description and classification for engineering purposes - IS Classification system - Phase relationships - Soil compaction - Theory, comparison of laboratory and field compaction methods - Ground improvements by compaction.

## UNIT II SOIL WATER AND WATER FLOW

8

Soil water - static pressure in water - Permeability measurement in the laboratory and field - Seepage - Introduction to flow nets - Simple problems.

## UNIT III STRESS DISTRIBUTION AND SETTLEMENT

9

Effective stress concepts in solids - Stress distribution in soil media - Use of influence charts - Components of settlement - Immediate and consolidation settlement - Terzaghi's one dimensional consolidation theory.

## UNIT IV SHEAR STRENGTH

9

Shear strength of cohesive and cohesion less soils - Mohr - Coulomb failure theory - saturated soil mass - Measurement of shear strength - direct shear - triaxial compression, UCC and Vane shear tests - Pore pressure parameters.

## UNIT V SLOPE STABILITY

9

Slope failure mechanisms - Types - Infinite slopes - Finite slopes - Total stress analysis for saturated clay - Method of slices - friction circle method - Use of stability number - Slope protection measures.

## TEXT BOOKS:

1. Punmia P.C., "Soil Mechanics and Foundations ", Laxmi Publications Pvt. Ltd., New Delhi 2005

#### REFERENCES:

1. Holtz R.D. and Kovacs W.D., "Introduction to Geotechnical Engineering ", Prentice-Hall, 1995.
2. [McCarthy P.D.F., "Essentials of Soil Mechanics and Foundations ", Prentice-Hall, 1973.](#)
3. Satten B.H.C., "Solving Problems in Soil Mechanics", Longman Group Scientific and Technical, U.K.England, 1994.
4. Khan I.H., "A text book of Geotechnical Engineering ", Prentice Hall of India, New Delhi, 1999.
5. Arora K.R., "Soil Mechanics and Foundation Engineering ", Standard Publishers and Distributors, New Delhi, 1997.

|                                                                                                                                                            |                                                |                                                        |   |   |   |   |          |          |          |          |   |   |   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------------------------|---|---|---|---|----------|----------|----------|----------|---|---|---|
| <b>BCE404</b>                                                                                                                                              | <b>BASIC STRUCTURAL DESIGN</b>                 |                                                        |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |   |
|                                                                                                                                                            | Total Contact Hours - 60                       |                                                        |   |   |   |   | <b>4</b> | <b>0</b> | <b>0</b> | <b>4</b> |   |   |   |
|                                                                                                                                                            | Prerequisite – Basic Mechanical Engineering    |                                                        |   |   |   |   |          |          |          |          |   |   |   |
|                                                                                                                                                            | Course Designed by – Dept of Civil Engineering |                                                        |   |   |   |   |          |          |          |          |   |   |   |
| <b>OBJECTIVES</b>                                                                                                                                          |                                                |                                                        |   |   |   |   |          |          |          |          |   |   |   |
| 1. To introduce the students to limit state design of structural steel members subjected to compressive, tensile and bending loads, including connections. |                                                |                                                        |   |   |   |   |          |          |          |          |   |   |   |
| 2. Design of structural systems such as roof trusses, purlins as per provisions of current code (IS 800 - 2007) of practice                                |                                                |                                                        |   |   |   |   |          |          |          |          |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                               |                                                |                                                        |   |   |   |   |          |          |          |          |   |   |   |
| CO1                                                                                                                                                        |                                                | To study about different materials used in masonry     |   |   |   |   |          |          |          |          |   |   |   |
| CO2                                                                                                                                                        |                                                | To analyse the steel structures.                       |   |   |   |   |          |          |          |          |   |   |   |
| CO3                                                                                                                                                        |                                                | To design of trusses and their members.                |   |   |   |   |          |          |          |          |   |   |   |
| CO4                                                                                                                                                        |                                                | To carry out the analysis of simple beams              |   |   |   |   |          |          |          |          |   |   |   |
| CO5                                                                                                                                                        |                                                | To study about different loading conditions on trusses |   |   |   |   |          |          |          |          |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                |                                                |                                                        |   |   |   |   |          |          |          |          |   |   |   |
| 1                                                                                                                                                          | COs/POs                                        | a                                                      | B | c | d | e | f        | g        | h        | i        | j | k | l |
| 2                                                                                                                                                          | CO1                                            | L                                                      |   | H | M |   |          |          |          |          |   |   |   |
|                                                                                                                                                            | CO2                                            | L                                                      |   | H | M |   |          |          |          |          |   |   |   |
|                                                                                                                                                            | CO3                                            | L                                                      |   | H | M |   |          |          |          |          |   |   |   |
|                                                                                                                                                            | CO4                                            | L                                                      |   | H | M |   |          |          |          |          |   |   |   |
|                                                                                                                                                            | CO5                                            | L                                                      |   | H | M |   |          |          |          |          |   |   |   |

|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                            |
|---|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|--------------------------------------------|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/Seminar/Internship (PR) |
|   |          |                                                                |                             |                    | √                      |                    |                         |                    |                                            |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                            |

## UNIT I MASONRY

12

Strength of bricks and masonry – Design of walls – Pillars and roofing as per the latest BIS codes. Timber Structures – Properties and strength of timber used in constructions – permissible stresses in timber – design of joints, using bolts, and metal connections – design of tension and compression members – beams in bending.

## UNIT II STEEL STRUCTURES

12

Introduction – properties of Indian standard rolled steel sections – types of loads, permissible stresses in tension, compression and shear as per BIS Code - Riveted and Bolted connections – Permissible stresses for various types of rivets and bolts -Efficiency of a joint - types of failures of riveted Joint - design of riveted and bolted connections for members subjected to axial forces - design of eccentrically loaded connections.

## UNIT III TENSION MEMBERS

12

Design of simple and compound steel sections subjected to tension- tension splice-Compression Members - Maximum slenderness ratio for different types of compression members – Design of simple and compound sections to resist compressive loads – design of battens and lacings – design of column base and connections – column splicings.

## UNIT IV BEAMS

12

Design of simple beams- strength and stiffness criteria – design of built up beams – curtailment of flange plates – connections between flange and web- need for lateral support for compression flange and their design – web strength of beams in shear – design of grillage foundation

## UNIT V ROOF TRUSSES

12

Types of roof trusses for different spans - design of pitched roof trusses for dead, live and wind loads - Design of joints, Design of supports and bearings – design of purlins.

### TEXT BOOKS:

1. Ramachandra S. Design of steel Structures, Vol I & II, Standard Publications, New Delhi 1982

### REFERENCES:

1. Arya.A.S. & Ajmani. IL "Design of Steel Structures". Nem Chand Bros., Roorkee (UP), 1992
2. Dayaratnam.P, "Design of Steel Structures", Wheelers Publishing Co.Ltd, 2008
3. Duggal, Design of Steel Structures, Tata McGraw Hill Co.II Edition,1991
4. Vazirani V.N. and Ratwani M.M. : Steel Structures , Khanna Publications, New Delhi,1976

**Note:** The relevant BIS Codes for the design of masonry (I.S.1905) Timber (LS883) and Steel Structures (IS 800) are permitted in the University Examinations. Steel Tables are also permitted in the University Examinations

|                                                                                                                                                                                 |                                                                            |                                                                |                             |   |                    |                        |   |                    |                         |   |                    |                                              |   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|---|--------------------|------------------------|---|--------------------|-------------------------|---|--------------------|----------------------------------------------|---|
| BCE405                                                                                                                                                                          |                                                                            | TRANSPORTATION ENGINEERING                                     |                             |   |                    |                        |   | L                  | T                       | P | C                  |                                              |   |
|                                                                                                                                                                                 |                                                                            | Total Contact Hours – 45                                       |                             |   |                    |                        |   | 3                  | 0                       | 0 | 3                  |                                              |   |
|                                                                                                                                                                                 |                                                                            | Prerequisite – Building Construction                           |                             |   |                    |                        |   |                    |                         |   |                    |                                              |   |
|                                                                                                                                                                                 |                                                                            | Course Designed by – Dept of Civil Engineering                 |                             |   |                    |                        |   |                    |                         |   |                    |                                              |   |
| OBJECTIVES                                                                                                                                                                      |                                                                            |                                                                |                             |   |                    |                        |   |                    |                         |   |                    |                                              |   |
| To give an overview about the highway engineering with respect to, planning, design, construction and maintenance of highways as per IRC standards, specifications and methods. |                                                                            |                                                                |                             |   |                    |                        |   |                    |                         |   |                    |                                              |   |
| COURSE OUTCOMES (COs)                                                                                                                                                           |                                                                            |                                                                |                             |   |                    |                        |   |                    |                         |   |                    |                                              |   |
| CO1                                                                                                                                                                             | To prepare the plan for highways as per IRC standards                      |                                                                |                             |   |                    |                        |   |                    |                         |   |                    |                                              |   |
| CO2                                                                                                                                                                             | To perform geometric design of urban and rural roads                       |                                                                |                             |   |                    |                        |   |                    |                         |   |                    |                                              |   |
| CO3                                                                                                                                                                             | Todesign flexible and rigid pavements using IRC methods                    |                                                                |                             |   |                    |                        |   |                    |                         |   |                    |                                              |   |
| CO4                                                                                                                                                                             | Tosuggests modern materials and methods of highway construction.           |                                                                |                             |   |                    |                        |   |                    |                         |   |                    |                                              |   |
| CO5                                                                                                                                                                             | Toevaluate, carry out maintenance and strengthening of existing pavements. |                                                                |                             |   |                    |                        |   |                    |                         |   |                    |                                              |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                                     |                                                                            |                                                                |                             |   |                    |                        |   |                    |                         |   |                    |                                              |   |
| 1                                                                                                                                                                               | COs/POs                                                                    | a                                                              | b                           | c | d                  | e                      | f | g                  | h                       | i | j                  | k                                            | l |
| 2                                                                                                                                                                               | CO1                                                                        |                                                                |                             | H | H                  |                        |   |                    |                         |   |                    |                                              |   |
|                                                                                                                                                                                 | CO2                                                                        |                                                                |                             | H | H                  |                        |   |                    |                         |   |                    |                                              |   |
|                                                                                                                                                                                 | CO3                                                                        |                                                                |                             | H | H                  |                        |   |                    |                         |   |                    |                                              |   |
|                                                                                                                                                                                 | CO4                                                                        |                                                                |                             | H | H                  |                        |   |                    |                         |   |                    |                                              |   |
|                                                                                                                                                                                 | CO5                                                                        |                                                                |                             | H | H                  |                        |   |                    |                         |   |                    |                                              |   |
| 3                                                                                                                                                                               | Category                                                                   | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) |   | Core Elective (CE) | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |
|                                                                                                                                                                                 |                                                                            |                                                                |                             |   |                    | √                      |   |                    |                         |   |                    |                                              |   |
| 4                                                                                                                                                                               | Approval                                                                   | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |   |                    |                        |   |                    |                         |   |                    |                                              |   |

## UNIT I HIGHWAY PLANNING AND ALIGNMENT

9

Highway Development in India, Macadam's Method of Road Construction, Jayakar Committee Recommendations and Realizations, Twenty-year Road Development Plans, Concepts of On-going Highway Development Programmes at National Level, Institutions for Highway Development at National level - Indian Roads Congress, National Highway Authority of India, Ministry of Road Transport and Highways (MORTH) and Central Road Research Institute. Requirements of Ideal Alignment, Factors Controlling Highway Alignment Engineering Surveys for Alignment - Conventional Methods and Modern Methods (Remote Sensing, GIS and GPS techniques) Classification and Cross Section of Urban and Rural Roads (IRC), Highway Cross Sectional Elements – Right of Way, Carriage Way, Camber, Krebs, Shoulders and Footpaths [IRC Standards]

**UNIT II GEOMETRIC DESIGN OF HIGHWAYS****9**

Design of Horizontal Alignments – Super elevation, Widening of Pavements on Horizontal Curves and Transition Curves [Derivation of Formulae and Problems] Design of Vertical Alignments – Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curves Sight Distances - Factors Affecting Sight Distances, PIEV Theory, Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight Distance at Intersections, Intermediate Sight Distance and Illumination Sight Distance [Derivations and Problems in SSD and OSD] Geometric Design of Hill Roads [IRC Standards Only]

**UNIT III DESIGN OF RIGID AND FLEXIBLE PAVEMENTS****9**

Rigid and Flexible Pavements- Components and their Functions Design Principles of Flexible and Rigid Pavements, Factors Affecting the Design of Pavements - ESWL, Climate, Sub-grade Soil and Traffic Design Practice for Flexible Pavements [CBR method, IRC Recommendations-Problems] Design Practice for Rigid Pavements – [IRC Recommendations-Problems]

**UNIT IV HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE****9**

Desirable Properties and Testing of Highway Materials: - (Tests have to be demonstrated in Highway Engineering Laboratory) Soil – California Bearing Ratio Test, Field Density Test, Aggregate - Crushing, Abrasion and Impact Tests Bitumen - Penetration, Ductility, Viscosity, Binder Content and Softening Point Tests. Construction Practice - Water Bound Macadam Road, Bituminous Road and Cement Concrete Road [as per IRC and MORTH specifications] Highway Drainage [IRC Recommendations]

**UNIT V HIGHWAY MAINTENANCE****9**

Types of Defects in Flexible Pavements – Surface Defects, Cracks, Deformation, Disintegration – Symptoms, Causes and Treatments. Types of Pavement Failures in Rigid Pavements – Scaling, Shrinkage, Warping, Structural Cracks, Spalling of Joints and Mud Pumping – and Special Repairs Pavement Evaluation – Pavement Surface Conditions and Structural Evaluation Overlay Design by Benkleman Beam Method [Procedure only]

**TEXT BOOKS:**

1. Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001.

**REFERENCES:**

1. Indian Roads Congress (IRC) specifications: Guidelines and special publications on Traffic Planning and Management
2. Transportation Engineering – An Introduction, C.Jotin Khisty, B.Kent Lall, Prentice Hall of India Pvt Ltd, 2006
3. MORTH Guidelines for Highway Engineering.
4. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2000

|               |                                                |          |          |          |          |
|---------------|------------------------------------------------|----------|----------|----------|----------|
| <b>BCE406</b> | <b>ENVIRONMENTAL STUDIES</b>                   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|               | Total Contact Hours - 45                       | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |
|               | Prerequisite – Physical Sciences               |          |          |          |          |
|               | Course Designed by – Dept of Civil Engineering |          |          |          |          |

|                                                                                                                                                               |                                                                                                                                         |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|---|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
| <b>OBJECTIVES</b>                                                                                                                                             |                                                                                                                                         |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 1. To study the nature and facts about environment.                                                                                                           |                                                                                                                                         |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 2. To find and implement scientific, technological, economic and political solutions to environmental problems.                                               |                                                                                                                                         |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 3. To study the interrelationship between living organism and environment.                                                                                    |                                                                                                                                         |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 4. To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value. |                                                                                                                                         |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 5. To study the dynamic processes and understand the features of the earth’s interior and surface.                                                            |                                                                                                                                         |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 6. To study the integrated themes and biodiversity, natural resources, pollution control and waste management.                                                |                                                                                                                                         |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                  |                                                                                                                                         |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO1                                                                                                                                                           | Play an important role in transferring a healthy environment for future generations                                                     |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO2                                                                                                                                                           | Analyze the impact of engineering solutions in a global and societal context                                                            |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO3                                                                                                                                                           | Discuss contemporary issues that results in environmental degradation and would attempt to provide solutions to overcome those problems |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO4                                                                                                                                                           | Ability to consider issues of environment and sustainable development in his personal and professional undertakings                     |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO5                                                                                                                                                           | Highlight the importance of ecosystem and biodiversity                                                                                  |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                   |                                                                                                                                         |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 1                                                                                                                                                             | COs/POs                                                                                                                                 | a                                                              | b | c                           | d | e                  | f                      | g | h                  | i | j                       | k | l                  |                                              |
| 2                                                                                                                                                             | CO1                                                                                                                                     |                                                                |   |                             |   |                    | H                      | H |                    |   |                         |   |                    |                                              |
|                                                                                                                                                               | CO2                                                                                                                                     |                                                                |   |                             |   |                    | H                      | H |                    |   |                         |   |                    |                                              |
|                                                                                                                                                               | CO3                                                                                                                                     |                                                                |   |                             |   |                    |                        | M |                    |   |                         |   |                    |                                              |
|                                                                                                                                                               | CO4                                                                                                                                     |                                                                |   |                             |   |                    | L                      | M | L                  |   |                         |   |                    |                                              |
|                                                                                                                                                               | CO5                                                                                                                                     |                                                                |   |                             |   |                    | M                      | M |                    |   |                         |   |                    |                                              |
| 3                                                                                                                                                             | Category                                                                                                                                | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                                                               |                                                                                                                                         |                                                                |   | √                           |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 4                                                                                                                                                             | Approval                                                                                                                                | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |

## UNIT I THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES 9

Definition, scope and importance, Need for public awareness.

### Natural Resources : Renewable And Non – Renewable Resources

Natural resources and associated problems

- Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effect on forests and tribal people.
- Water resources : Use and over-utilization of surface and ground water, flood, drought conflicts over water, dams-benefits and problems.
- Mineral resources : Uses and exploitation, environmental effects of extracting and using mineral resources, case studies.

- d) Food resources : World food problems, changes caused by agriculture and overgrazing , effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- e) Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, case studies.
- f) Land resources : Land as a resource, Land degradation, man induced landslides, soil erosion and desertification

Role of an individual in conservation of natural resources, Equitable use of resources for sustainable lifestyles.

## **UNIT II ECOSYSTEMS**

**8**

Concepts of an ecosystem. Structure and function of an ecosystem, producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids - Introduction, types, characteristic features, structure and function of the following ecosystem :- Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, (ponds, streams, lakes, rivers, oceans, estuaries)-

Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation - Ethics : Issues and possible Solutions, Climate change, global warming, acid rain, ozone layer depletion.

## **UNIT III BIODIVERSITY AND ITS CONSERVATION**

**7**

Introduction and Definition - genetic, species and ecosystems diversity, Biogeographical classification of India - Value biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, national and local levels. India as a mega-diversity nation, Hot-spots of biodiversity -Threats to biodiversity, habitat, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation biodiversity - In-situ and Ex-situ conservation of biodiversity.

## **Environmental Pollution**

**7**

Definition, Causes, effects and control measures of :- Air Pollution, Water pollution, Soil Pollution, Marine Pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management : Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution - Pollution case studies - Disaster Management : floods earthquake, cyclone and landslides.

## **UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT**

**8**

From Unsustainable to Sustainable development, Urban problems related to energy, nuclear accident and holocaust, case studies, wasteland reclamation, Environmental Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife protection Act, Forest Conservation Act, Issues involved in enforcement of environmental Legislation, public awareness –

Fireworks and its impact on the Environment – Chemicals used in Fireworks – (Fuel –oxidizing Agent – Reducing Agent –Toxic Materials – Fuel –Binder- Regulator) – Harmful nature of ingredients – chemical effects on health due to inhaling fumes – Noise produced by fire crackers – Noise pollution – Noise level standards for fire crackers – Intensity of sound – Impact on hearing – Safety measures.

**UNIT V HUMAN POPULATION AND THE ENVIRONMENT****6**

Population growth, variation among nations, population explosion-Family Welfare programs, Environment and human health, Human Rights, Value Education, HIV and AIDS, Women and Child Welfare, Role of Information Technology in Environment and Human health - Case Studies.

**TEXTBOOKS:**

1. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., Second Edition, ISBN 81-297 0277-0, 2004.
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
3. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,Ahmedabad – 380 013, India, 1989.
4. Benny Joseph, "Environmental Studies", TATA McGraw Hill, 2010

**REFERENCES**

1. Trivedi R.K., "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol.I and II, EnviroMedia 2009
2. Cunningham, W.P.Cooper, T.H.Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
3. Wager K.D. "Environmental Management", W.B. Saunders Co., Philadelphia, USA, 1998.
4. Trivedi R.K. and P.K. Goel, "Introduction to Air Pollution", Techno Science Publications 2013
5. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB),2001.
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
7. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
8. Jadhav, H &Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
9. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.
10. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
11. Rao M N. &Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publish Co. Pvt. Ltd. 345p.
12. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut.
13. <http://eng.mft.info/uploadedfiles/gfiles/c8e31c9e52d84c3.pdf>

|                                                                                       |                                                          |          |          |          |          |
|---------------------------------------------------------------------------------------|----------------------------------------------------------|----------|----------|----------|----------|
| <b>BCE4L1</b>                                                                         | <b>SURVEYING PRACTICAL - II</b>                          | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                       | Total Contact Hours - 45                                 | <b>0</b> | <b>0</b> | <b>3</b> | <b>2</b> |
|                                                                                       | Prerequisite – Survey practical-I                        |          |          |          |          |
|                                                                                       | Course Designed by – Dept of Civil Engineering           |          |          |          |          |
| <b>OBJECTIVES</b>                                                                     |                                                          |          |          |          |          |
| To understand field problems like tachometry, setting out for foundation marking etc. |                                                          |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                          |                                                          |          |          |          |          |
| CO1                                                                                   | Take angular and linear measurements using total station |          |          |          |          |

|                                                                                                                             |                                                              |                                                                |                             |   |                    |                        |   |                    |   |                         |   |                    |   |                                             |
|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|---|--------------------|------------------------|---|--------------------|---|-------------------------|---|--------------------|---|---------------------------------------------|
| CO2                                                                                                                         | Prepare contour maps for the given area                      |                                                                |                             |   |                    |                        |   |                    |   |                         |   |                    |   |                                             |
| CO3                                                                                                                         | Field observation for the calculation of azimuth.            |                                                                |                             |   |                    |                        |   |                    |   |                         |   |                    |   |                                             |
| CO4                                                                                                                         | Determination of personal stereoscopic acuity in laboratory. |                                                                |                             |   |                    |                        |   |                    |   |                         |   |                    |   |                                             |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                              |                                                                |                             |   |                    |                        |   |                    |   |                         |   |                    |   |                                             |
| 1                                                                                                                           | COs/POs                                                      | a                                                              | b                           | c | d                  | e                      | f | g                  | h | i                       | j | k                  | l |                                             |
| 2                                                                                                                           | CO1                                                          | M                                                              | M                           |   |                    | L                      |   |                    |   |                         |   |                    |   |                                             |
|                                                                                                                             | CO2                                                          |                                                                | M                           |   |                    | L                      |   |                    |   |                         |   |                    |   |                                             |
|                                                                                                                             | CO3                                                          |                                                                | M                           |   |                    |                        |   |                    |   |                         |   |                    |   |                                             |
|                                                                                                                             | CO4                                                          |                                                                |                             |   |                    |                        |   |                    |   |                         |   |                    |   |                                             |
|                                                                                                                             | CO5                                                          | L                                                              |                             |   |                    | L                      |   |                    |   |                         |   |                    |   |                                             |
| 3                                                                                                                           | Category                                                     | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) |   | Project/Term Paper/Seminar/ Internship (PK) |
|                                                                                                                             |                                                              |                                                                |                             |   |                    | √                      |   |                    |   |                         |   |                    |   |                                             |
| 4                                                                                                                           | Approval                                                     | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |   |                    |                        |   |                    |   |                         |   |                    |   |                                             |

#### UNIT I TACHEOMETRY

12

Tangential system (using theodolite, leveling staff)

Stadia system (using theodolite, leveling staff)

Subtense system (using theodolite, tape, cross staff, leveling staff)

#### UNIT II SETTING OUT WORKS

12

Foundation marking (using theodolite, tape, ranging rods)

Simple curve - right / left handed (using theodolite, tape, ranging rods)

Transition curve (using theodolite, tape, ranging rods)

#### UNIT III FIELD ASTRONOMY

9

Field observation for the calculation of azimuth (using theodolite, tape)

#### UNIT IV ELECTRONIC SURVEYING (USING PHOTOGRAMMETRY ACCESSORIES/INSTRUMENTS)

12

Practicing fusion of stereo pairs of charts and photographs to get 3D

Use of pocket stereoscope and parallax bars

Determination of personal stereoscopic acuity in laboratory

Work on stereo test charts to access stereoscopic ability

|                                                                                             |                                                |   |   |   |   |
|---------------------------------------------------------------------------------------------|------------------------------------------------|---|---|---|---|
| BCE4L2                                                                                      | SOIL MECHANICS LABORATORY                      | L | T | P | C |
|                                                                                             | Total Contact Hours - 45                       | 0 | 0 | 3 | 2 |
|                                                                                             | Prerequisite – Soil Mechanics                  |   |   |   |   |
|                                                                                             | Course Designed by – Dept of Civil Engineering |   |   |   |   |
| OBJECTIVES                                                                                  |                                                |   |   |   |   |
| To understand and assess both Physical and Engineering behavior of soils through laboratory |                                                |   |   |   |   |

|                                                                                                                             |                                                                                                         |                                                                |   |                             |   |                    |                         |   |                    |                         |   |                    |                                               |
|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|-------------------------|---|--------------------|-------------------------|---|--------------------|-----------------------------------------------|
| testing procedures.                                                                                                         |                                                                                                         |                                                                |   |                             |   |                    |                         |   |                    |                         |   |                    |                                               |
| COURSE OUTCOMES (COs)                                                                                                       |                                                                                                         |                                                                |   |                             |   |                    |                         |   |                    |                         |   |                    |                                               |
| CO1                                                                                                                         | To learn about the different type of soil according to their classification and their size distribution |                                                                |   |                             |   |                    |                         |   |                    |                         |   |                    |                                               |
| CO2                                                                                                                         | To determine the soil’s property and their atterberg’s limit.                                           |                                                                |   |                             |   |                    |                         |   |                    |                         |   |                    |                                               |
| CO3                                                                                                                         | To have a clear understanding about determining the optimum moisture                                    |                                                                |   |                             |   |                    |                         |   |                    |                         |   |                    |                                               |
| CO4                                                                                                                         | About the compressive strength of the soil which is obtain from the site.                               |                                                                |   |                             |   |                    |                         |   |                    |                         |   |                    |                                               |
| CO5                                                                                                                         | To know about permeability of the soil, consolidate test on the soil.                                   |                                                                |   |                             |   |                    |                         |   |                    |                         |   |                    |                                               |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                         |                                                                |   |                             |   |                    |                         |   |                    |                         |   |                    |                                               |
| 1                                                                                                                           | COs/POs                                                                                                 | a                                                              | b | c                           | d | e                  | f                       | g | h                  | i                       | j | k                  | L                                             |
| 2                                                                                                                           | CO1                                                                                                     | M                                                              | H | M                           | M | M                  |                         |   |                    |                         |   |                    |                                               |
|                                                                                                                             | CO2                                                                                                     | L                                                              | M | H                           |   |                    |                         |   |                    |                         |   |                    |                                               |
|                                                                                                                             | CO3                                                                                                     |                                                                |   | M                           | M |                    |                         |   |                    |                         |   |                    |                                               |
|                                                                                                                             | CO4                                                                                                     | L                                                              |   |                             |   |                    |                         |   |                    |                         |   |                    |                                               |
|                                                                                                                             | CO5                                                                                                     |                                                                |   | M                           | M |                    |                         |   |                    |                         |   |                    |                                               |
| 3                                                                                                                           | Category                                                                                                | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professiona l Core (PC) |   | Core Elective (CE) | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Ter m Paper/ Seminar/ Internship (PR) |
|                                                                                                                             |                                                                                                         |                                                                |   |                             |   |                    | √                       |   |                    |                         |   |                    |                                               |
| 4                                                                                                                           | Approval                                                                                                | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |                         |   |                    |                         |   |                    |                                               |

#### LIST OF EXPERIMENTS

1. Grain size distribution - Sieve analysis
2. Grain size distribution - Hydrometer analysis
3. Atterberg limits test
4. Determination of moisture - Density relationship using standard proctor.
5. Permeability determination (constant head and falling head methods)
6. Determination of shear strength parameters.
  - a) Direct shear test on cohesion less soil
  - b) Unconfined compression test on cohesive soil
  - c) Tri axial compression test on cohesion less soil
7. One dimensional consolidation test (Determination of co-efficient of consolidation only)

#### REFERENCES:

1. " Soil Engineering Laboratory Instruction Manual ", Published by the Engineering CollegeCo-operatiave Society, Chennai,
2. Lambe T.W., "Soil Testing for Engineers ", John Wiley and Sons, New York, 1990.
3. "I.S.Code of Practice (2720) Relevant Parts ", as amended from time to time.

|               |                                        |  |  |  |          |          |          |          |
|---------------|----------------------------------------|--|--|--|----------|----------|----------|----------|
| <b>BCE501</b> | <b>STRUCTURAL ANALYSIS – I</b>         |  |  |  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|               | Total Contact Hours - 60               |  |  |  | 4        | 0        | 0        | 4        |
|               | Prerequisite – Basic Structural Design |  |  |  |          |          |          |          |

|                                                                                                                                         |          |                                                                                                                                   |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
|-----------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|--------------------|----------------------------------------------|---|
|                                                                                                                                         |          | Course Designed by – Dept of Civil Engineering                                                                                    |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| <b>OBJECTIVES</b>                                                                                                                       |          |                                                                                                                                   |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| To introduce the students to basic theory and concepts of structural analysis and the classical methods for the analysis of structures. |          |                                                                                                                                   |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                            |          |                                                                                                                                   |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| CO1                                                                                                                                     |          | Analyze the pin jointed plane frames using energy and consistent deformation method                                               |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| CO2                                                                                                                                     |          | Analyze indeterminate structures using various classical methods.                                                                 |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| CO3                                                                                                                                     |          | Determine absolute maximum bending moment and shear force in beams due to moving loads.                                           |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| CO4                                                                                                                                     |          | Find the maximum moment, shear and stresses produced in arches due to external loads temperature effects and support settlements. |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| CO5                                                                                                                                     |          | To find the influence line diagram for determinate structures.                                                                    |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low             |          |                                                                                                                                   |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| 1                                                                                                                                       | COs/POs  | a                                                                                                                                 | b | c                           | d | e                  | f                      | g                  | h | i                       | j                  | k                                            | L |
| 2                                                                                                                                       | CO1      | M                                                                                                                                 |   | M                           | H |                    |                        |                    |   |                         |                    |                                              |   |
|                                                                                                                                         | CO2      | M                                                                                                                                 |   | M                           | H |                    |                        |                    |   | L                       |                    |                                              |   |
|                                                                                                                                         | CO3      | M                                                                                                                                 |   | M                           | H |                    |                        |                    |   |                         | L                  |                                              |   |
|                                                                                                                                         | CO4      | M                                                                                                                                 |   | M                           | H |                    |                        |                    |   | L                       |                    |                                              | L |
|                                                                                                                                         | CO5      | M                                                                                                                                 |   | M                           | H |                    |                        |                    |   |                         | L                  |                                              |   |
|                                                                                                                                         | CO6      |                                                                                                                                   |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| 3                                                                                                                                       | Category | Humanities & Social Studies (HS)                                                                                                  |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |
|                                                                                                                                         |          |                                                                                                                                   |   |                             |   |                    | √                      |                    |   |                         |                    |                                              |   |
| 4                                                                                                                                       | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016                                                                    |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |

## UNIT I INDETERMINATE ANALYSIS

12

Indeterminate Structures: Introduction to static and kinematic Indeterminacy- two and three dimensional pin jointed and rigid jointed structures-space trusses-Energy method-application to indeterminate pin jointed trusses-temperature effect-beams curved in plan.

## UNIT II SLOPE DEFLECTION METHOD

12

Slope deflection method: Analysis of continuous beams and portal frames with single storey.

## UNIT III MOMENT DISTRIBUTION METHOD

12

Moment distribution method: Stiffness and distribution factors-carry over factor-analysis of continuous beams -single storied portal frames.

## UNIT IV ROLLING LOADS

12

Rolling loads: Single concentrated loads - two concentrated loads-uniformly distributed loads- curves of maximum SFD and BMD – equivalent. UDL

## UNIT V INFLUENCE LINE DIAGRAMS

12

Influence line for statically determinate beams for bending moment and shear force- absolute maximum BM-concentrated and UDL- Influence line for forces in members for statically determinate truss parallel chord truss.

### TEXT BOOK:

1. Vaidyanadhan, R and Perumal, P, “Comprehensive Structural Analysis – Vol. 1 & Vol. 2”, Laxmi Publications, New Delhi, 2003.

### REFERENCE:

1. Bhavai Katti, S.S, Structural Analysis – Vol. 1 & Vol. 2, Vikas Publishing Pvt Ltd., New Delhi, 2008
2. Analysis of Indeterminate Structures – C.K. Wang, Tata McGraw-Hill, 1992.
3. Negi L.S. Jangid & R.S., “Structural Analysis”, Tata McGraw-Hill Publications, New Delhi, Sixth Edition, 2003.

|                                                                                                                                        |         |                                                                                                                           |   |   |   |   |   |   |   |   |   |   |   |
|----------------------------------------------------------------------------------------------------------------------------------------|---------|---------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|
| BCE502                                                                                                                                 |         | APPLIED HYDRAULIC ENGINEERING                                                                                             |   |   |   |   |   | L | T | P | C |   |   |
|                                                                                                                                        |         | Total Contact Hours - 45                                                                                                  |   |   |   |   |   | 3 | 0 | 0 | 3 |   |   |
|                                                                                                                                        |         | Prerequisite – Fluid Mechanics                                                                                            |   |   |   |   |   |   |   |   |   |   |   |
|                                                                                                                                        |         | Course Designed by – Dept of Civil Engineering                                                                            |   |   |   |   |   |   |   |   |   |   |   |
| OBJECTIVES                                                                                                                             |         |                                                                                                                           |   |   |   |   |   |   |   |   |   |   |   |
| 1. To introduce the students to various hydraulic engineering problems like open channel flows and hydraulic machines.                 |         |                                                                                                                           |   |   |   |   |   |   |   |   |   |   |   |
| 2. At the completion of the course, the student should be able to relate the theory and practice of problems in hydraulic engineering. |         |                                                                                                                           |   |   |   |   |   |   |   |   |   |   |   |
| COURSE OUTCOMES (COs)                                                                                                                  |         |                                                                                                                           |   |   |   |   |   |   |   |   |   |   |   |
| CO1                                                                                                                                    |         | Be able to apply their knowledge of fluid mechanics in addressing problems in open channels.                              |   |   |   |   |   |   |   |   |   |   |   |
| CO2                                                                                                                                    |         | They will possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions. |   |   |   |   |   |   |   |   |   |   |   |
| CO3                                                                                                                                    |         | They will have knowledge in hydraulic machineries (Turbines)                                                              |   |   |   |   |   |   |   |   |   |   |   |
| CO4                                                                                                                                    |         | Acquire skills in rotodynamic machineries that will help in their day-to-day-life.                                        |   |   |   |   |   |   |   |   |   |   |   |
| CO5                                                                                                                                    |         | Acquire skills in Reciprocal pumps.                                                                                       |   |   |   |   |   |   |   |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low            |         |                                                                                                                           |   |   |   |   |   |   |   |   |   |   |   |
| 1                                                                                                                                      | COs/POs | a                                                                                                                         | b | c | d | e | f | g | h | i | j | k | l |
| 2                                                                                                                                      | CO1     | H                                                                                                                         | M | L | H | H |   |   |   |   |   |   | H |
|                                                                                                                                        | CO2     | H                                                                                                                         | M | L | H | H |   |   |   |   |   |   | H |
|                                                                                                                                        | CO3     | H                                                                                                                         | M | L | H | H |   |   |   |   |   |   | M |
|                                                                                                                                        | CO4     | H                                                                                                                         | M | L | H | H |   |   |   |   |   |   | M |

|   |          |                                                                |   |                                      |                  |                           |                          |                               |                          |                                                          |  |  |   |
|---|----------|----------------------------------------------------------------|---|--------------------------------------|------------------|---------------------------|--------------------------|-------------------------------|--------------------------|----------------------------------------------------------|--|--|---|
|   | CO5      | H                                                              | M | L                                    | H                | H                         |                          |                               |                          |                                                          |  |  | M |
| 3 | Category | Humanities<br>& Social<br>Studies (HS)                         |   | Basic<br>Sciences<br>& Maths<br>(BS) | Engg<br>Sciences | Professional<br>Core (PC) | Core<br>Elective<br>(CE) | Non-Major<br>Elective<br>(NE) | Open<br>Elective<br>(OE) | Project/Term<br>Paper/<br>Seminar/<br>Internship<br>(PR) |  |  |   |
|   |          |                                                                |   |                                      |                  | √                         |                          |                               |                          |                                                          |  |  |   |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                                      |                  |                           |                          |                               |                          |                                                          |  |  |   |

### UNIT I OPEN CHANNEL FLOW

9

Types of flow – State of Flow - Velocity distribution - Specific energy, specific force, critical flow computation - flow measurement. Chezy's and Manning's equation, Computation Uniform flow – Normal depth – Hydraulically best section.

### UNIT II VARIED FLOW

9

Varied Flow- Rapid & Gradual - Dynamic equation characteristic of flow profiles – Classification of flow – Computation of the flow profiles – Direct step method - Canal transitions – Hydraulic Jump – Type of Jump, Location of Jumps – Energy losses in Jumps – Surges in Canal – Types of Surges.

### UNIT III TURBINES

9

Rotodynamics Machinery Turbines: Classification of turbines -Work done - Efficiency of Turbines, Pelton Wheel, Francis turbine, Kaplan and propeller turbines. Similarity laws and specific speed. Performance of turbines - impact of free jets.

### UNIT IV PUMPS

9

Rotodynamic Machinery Pumps: Classification of pumps –Centrifugal Pumps – Casing – Impellor – Work done and Efficiency – Cavitations.

### UNIT V RECIPROCATING PUMPS

9

Reciprocating pump – Work done – Air Vessel – Indicator Diagram.

### TEXT BOOK:

1. Bansal R K., A Text Book of Fluid Mechanics & Hydraulic Machines – Laxmi Publications 2010

### REFERENCE:

1. Subramanya K., "Flow in Open channels ", Tata McGraw Hill Publishing Company 1986
2. Kumar K.L., "Engineering Fluid Mechanics ", Eurasia Publishing House (P) Ltd. New Delhi, 1992.
3. Rajput R.K, A Text of Fluid Mechanics & Hydraulic machines – S.Chand & Co.P.Ltd, 2009

|        |                               |  |  |  |  |   |   |   |   |
|--------|-------------------------------|--|--|--|--|---|---|---|---|
| BCE503 | FOUNDATION ENGINEERING        |  |  |  |  | L | T | P | C |
|        | Total Contact Hours - 45      |  |  |  |  | 3 | 0 | 0 | 3 |
|        | Prerequisite – Soil Mechanics |  |  |  |  |   |   |   |   |

|                                                                                                                                                                                                       |          |                                                                                                      |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------------------------------------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|---|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
|                                                                                                                                                                                                       |          | Course Designed by – Dept of Civil Engineering                                                       |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| <b>OBJECTIVES</b>                                                                                                                                                                                     |          |                                                                                                      |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| To impart knowledge on common method of sub soil investigation and design of foundation and to acquire the capacity to investigate the soil condition and to select and design a suitable foundation. |          |                                                                                                      |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                                          |          |                                                                                                      |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO1                                                                                                                                                                                                   |          | Select type of foundation required for the given soil condition.                                     |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO2                                                                                                                                                                                                   |          | Determine the settlement of the foundation on different types of soil                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO3                                                                                                                                                                                                   |          | Find the dimensions of the foundation for isolated footing, combined footing and floating foundation |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO4                                                                                                                                                                                                   |          | Analyze the group of piles for their load capacity                                                   |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO5                                                                                                                                                                                                   |          | Carry out stability analysis of retaining walls.                                                     |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                                                           |          |                                                                                                      |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 1                                                                                                                                                                                                     | COs/POs  | a                                                                                                    | b | c                           | d | e                  | f                      | g | h                  | i | j                       | k | l                  |                                              |
| 2                                                                                                                                                                                                     | CO1      |                                                                                                      |   | H                           | H |                    |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                                                       | CO2      |                                                                                                      |   | H                           | H |                    |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                                                       | CO3      | L                                                                                                    |   | H                           | H |                    |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                                                       | CO4      | M                                                                                                    |   | H                           | H |                    |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                                                       | CO5      | H                                                                                                    |   | H                           | H |                    |                        |   |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                                                       | CO6      |                                                                                                      |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 3                                                                                                                                                                                                     | Category | Humanities & Social Studies (HS)                                                                     |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                                                                                                       |          |                                                                                                      |   |                             |   |                    | √                      |   |                    |   |                         |   |                    |                                              |
| 4                                                                                                                                                                                                     | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016                                       |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |

## UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION 9

Introduction – Scope and objectives – Method of exploration: boring – Sampling – disturbed and undisturbed sampling – sampling techniques – Bore log and report – Penetration tests– Data interpretation – Selection of foundation based on soil condition

## UNIT II SHALLOW FOUNDATION 9

Introduction – Location and depth of foundation – codal provisions – bearing capacity of shallow foundation on homogeneous deposits – bearing capacity from in-situ tests – Factors influencing bearing capacity – codal provisions – Settlement – Components of settlement – Settlement of foundations on granular and clay deposits – Allowable and maximum differential settlements of buildings – Codal provision – Methods of minimizing settlement.

## UNIT III DESIGN OF FOOTING 9

Types of foundation – structural design of spread footing – Design aspects of combined and mat foundation – Codal provisions.

**UNIT IV PILE FOUNDATION****9**

Types of piles – Factors influencing the selection of pile – Carrying capacity in granular and cohesive soils – Static and dynamic formulae – Capacity from in-situ tests – Piles subjected to uplift – Negative skin friction – Group capacity – Settlement of pile groups – Interpretation of pile load test – Pile caps – Codal provisions

**UNIT V RETAINING WALLS****9**

Earth pressure theory – Plastic equilibrium in soils – active and passive states – Rankine's theory – Coloumb's wedge theory – Classical and limit equilibrium solution – Earth pressure on retaining walls of simple configurations – pressure on the wall due to single line load alone – Graphical method (Culmann's method alone) – Stability of retaining wall.

**TEXT BOOKS:**

1. Punmia, B.C., Soil mechanics and foundations, Laxmi publications pvt. Ltd., New Delhi.

**REFERENCES:**

1. Khan, I.H., A text book of Geotechnical Engineering, Prentice Hall of India, New Delhi, 1999.
2. Arora K.R. Soil mechanics and foundation engineering, standard publishers and distributors, New Delhi, 1997.
3. Bowles J.E. Foundation analysis and design, McGraw Hill, 1994.
4. Gopal Ranjan and Rao, A.S.R. Basic and applied soil mechanics, Wiley Eastern Ltd., New Delhi (India), 1997.

|                                                                                                                             |                                                                                                                |                                                |   |   |   |   |   |   |   |   |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|
| BCE504                                                                                                                      |                                                                                                                | REINFORCED CONCRETE STRUCTURES – I             |   |   |   |   |   | L | T | P | C |   |   |
|                                                                                                                             |                                                                                                                | Total Contact Hours - 60                       |   |   |   |   |   | 4 | 0 | 0 | 4 |   |   |
|                                                                                                                             |                                                                                                                | Prerequisite – Theory Of Structures            |   |   |   |   |   |   |   |   |   |   |   |
|                                                                                                                             |                                                                                                                | Course Designed by – Dept of Civil Engineering |   |   |   |   |   |   |   |   |   |   |   |
| COURSE OUTCOMES (COs)                                                                                                       |                                                                                                                |                                                |   |   |   |   |   |   |   |   |   |   |   |
| CO1                                                                                                                         | Design RC concrete structural elements using various methods.                                                  |                                                |   |   |   |   |   |   |   |   |   |   |   |
| CO2                                                                                                                         | Design reinforced concrete slabs and beams by WSD for flexure                                                  |                                                |   |   |   |   |   |   |   |   |   |   |   |
| CO3                                                                                                                         | Design various basic elements of reinforced concrete structures like slabs, beams, columns and footings by LSD |                                                |   |   |   |   |   |   |   |   |   |   |   |
| CO4                                                                                                                         | Design reinforced concrete slabs and beams for shear and torsion by LSD                                        |                                                |   |   |   |   |   |   |   |   |   |   |   |
| CO5                                                                                                                         | Design reinforced concrete Footing                                                                             |                                                |   |   |   |   |   |   |   |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                                |                                                |   |   |   |   |   |   |   |   |   |   |   |
| 1                                                                                                                           | COs/POs                                                                                                        | a                                              | b | c | d | e | f | g | h | i | j | k | L |
| 2                                                                                                                           | CO1                                                                                                            | M                                              |   | H | M |   |   |   |   |   |   |   |   |
|                                                                                                                             | CO2                                                                                                            | M                                              |   | H | M |   |   |   |   |   |   |   |   |
|                                                                                                                             | CO3                                                                                                            | M                                              |   | H | M |   |   |   |   |   |   |   |   |
|                                                                                                                             | CO4                                                                                                            | M                                              |   | H | M |   |   |   |   |   |   |   |   |
|                                                                                                                             | CO5                                                                                                            | M                                              |   | H | M |   |   |   |   |   |   |   |   |

|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                             |
|---|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---------------------------------------------|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/Seminar/ Internship (PR) |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                             |

## UNIT I INTRODUCTION

12

Actual and idealized stress- strain diagrams of concrete and steel (Mild Steel, High Strength deformed bars) – behavior of R.C.beam in bending – introduction to the ESD philosophy – Design of rectangular beams, tee beams, shear, development length- design of one way slab, two way slabs BIS 456 2000.

## UNIT II WORKING STRESS METHOD

12

Design of continuous beams and slabs – axially and eccentrically loaded column footings for individual columns and combined rectangular footings for two columns.

## UNIT III DESIGN OF BEAMS

12

Limit state design of rectangular T and L shaped beams for flexure, shear, bond torsion, - design of one way slab – Lintels – sun shades.

## UNIT IV LSM: DESIGN OF SLABS & COLUMNS

12

Limit state design of two way slab using BIS 456 – limit state design of short rectangular and circular columns for axial and eccentric loads using SP- 16 design of long columns.

## UNIT V LSM: DESIGN OF FOOTING

12

Limit state design of square / rectangular footings for axially and eccentrically loaded columns combined rectangular footings for two columns.

## TEXT BOOKS:

1. Krishna Raju, N., “Design of Reinforced Concrete Structures”, CBS Publishers & Distributors, New Delhi, 2003

## REFERENCES:

1. Jain.A.K. Limit State Design of R.C.Structures, Nerchand Publications
2. BIS 456 – 2000
3. S.P.16 of BIS
4. W.H. & R.S. Mosely, J.H.Bungcy an R.Hulse, Reinforced Concrete Design, 5<sup>th</sup> Edition, Macmillan Co.
5. Ramamrutham S, Design of Steel Structures, Dhanpat Rai Publishing Co., New. Delhi, 2001
6. Dr.Purushothaman P Reinforced Concrete Structures Tata McGraw-Hill, 1984

|               |                                  |          |          |          |          |
|---------------|----------------------------------|----------|----------|----------|----------|
| <b>BCE505</b> | <b>ENVIRONMENTAL ENGINEERING</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|               | Total Contact Hours - 45         | 3        | 0        | 0        | 3        |

|                                                                                                                             |          |                                                                |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
|-----------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|-------------------------|--------------------|----------------------------------------------|---|---|
|                                                                                                                             |          | Prerequisite – Environmental Studies                           |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
|                                                                                                                             |          | Course Designed by – Dept of Civil Engineering                 |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| <b>OBJECTIVES:</b><br>To make the students conversant with principles of water supply, treatment and distribution           |          |                                                                |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                |          |                                                                |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| CO1                                                                                                                         |          | Plan water supply system for developing area                   |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| CO2                                                                                                                         |          | Design the various treatment plant in water supply system      |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| CO3                                                                                                                         |          | Treat the drinking water using advanced techniques             |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| CO4                                                                                                                         |          | Design the water distribution systems                          |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| CO5                                                                                                                         |          | Principles of design of water supply and drainage in buildings |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| 1                                                                                                                           | COs/POs  | a                                                              | b | c                           | d | e                  | f                      | g                  | h                       | i                  | j                                            | k | L |
| 2                                                                                                                           | CO1      |                                                                |   | H                           | M |                    |                        |                    |                         |                    |                                              |   |   |
|                                                                                                                             | CO2      | M                                                              |   | H                           | M |                    |                        |                    | M                       |                    |                                              |   |   |
|                                                                                                                             | CO3      |                                                                |   | H                           | M |                    |                        |                    |                         |                    |                                              | L |   |
|                                                                                                                             | CO4      | L                                                              |   | H                           | M |                    |                        |                    |                         |                    |                                              |   |   |
|                                                                                                                             | CO5      | M                                                              |   | H                           | M |                    |                        |                    |                         |                    |                                              |   |   |
| 3                                                                                                                           | Category | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |   |
|                                                                                                                             |          |                                                                |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
|                                                                                                                             |          |                                                                |   |                             |   | √                  |                        |                    |                         |                    |                                              |   |   |
| 4                                                                                                                           | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |

### UNIT-I PLANNING FOR WATER SUPPLY AND SEWERAGE SYSTEMS 9

Public water supply System and Sewerage system – Design Period – Prediction of population during design period – Selection of Sources of Water supply – Conveyance of Raw Water – Treatment site – Piped Flow – Open Channel Flow – Layout of Water Treatment Plant.

### UNIT-II WATER TREATMENT SYSTEMS 9

Raw water Quality – Impurities in Water – Water Quality Standards – Plain Sedimentation – Pumping to Chemical House – Coagulation – Hydraulic Jump / Flash Mixer – Clariflocculator – Rapid Sand Filtration – Iron & Manganese Removal - Post Chlorination – Clear Water Tank – Pumping to Overhead Tank.

### UNIT-III WATER DISTRIBUTION SYSTEM 9

Water Distribution Layout – Service Reservoirs – Hydraulics of Flow in Pipes - Appurtenances – Construction Operation and maintenance – Leak Detection – Storm Water Network – Plumbing Work in Houses.

**UNIT-IV COLLECTION AND CONVEYANCE OF DOMESTIC SEWAGE 9**

Sewer Pipe Network – Sewage Treatment Site – Activated Sludge Process – Aeration Tank Design – Design of Secondary Settling Tank – Sludge Digester – Sludge Drying Beds – Re-Use of Treated Effluent – Selection of Pumps.

**UNIT-V SOLID WASTE MANAGEMENT 9**

Collection and Conveyance of Solid Wastes – Segregation of Solid Wastes – Sanitary Land Fill – Incineration – Recycling and Re-use Concepts – Disposal of Electronic Wastes.

**TEXT BOOKS:**

1. Garg S.K.Environmental Engineering, Vol.I & II, Khanna Publishers, New Delhi, (1994).
2. Water Supply Engineering, R.Pannirselvam, SPGS-Publications, Adambakkam, Chennai-600088, (2007).
3. Wastewater Engineering, SPGS-Publications, Adambakkam, Chennai-600088,(2007).
4. C.S.Shah, Water Supply Sanitation, Galgotia Publishing Company, New Delhi, (1994).

**REFERENCES:**

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, (1999).
2. Manual on Sewerage and Sewage Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, (1993).
3. Wastewater Engineering – Treatment and Re-Use, MetCalf & Eddy, Inc., Tata McGraw-Hill Publishing Company, New Delhi-(2003).
- 4.

|                                                                                                                                                                                                          |                                                                                                                          |          |          |          |          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|----------|----------|----------|----------|
| <b>BCE506</b>                                                                                                                                                                                            | <b>CONSTRUCTION TECHNOLOGY</b>                                                                                           | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                                                                                                                          | Total Contact Hours - 45                                                                                                 | 3        | 0        | 0        | 3        |
|                                                                                                                                                                                                          | Prerequisite – Building Construction                                                                                     |          |          |          |          |
|                                                                                                                                                                                                          | Course Designed by – Dept of Civil Engineering                                                                           |          |          |          |          |
| <b>OBJECTIVES:</b>                                                                                                                                                                                       |                                                                                                                          |          |          |          |          |
| 1. The main objective of this course is to make the student aware of the various construction techniques, practices and the equipment needed for different types of construction activities.             |                                                                                                                          |          |          |          |          |
| 2. To understand various construction procedures from sub structure to super structure and also the equipment needed for construction of various types of structures from foundation to super structure. |                                                                                                                          |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                                             |                                                                                                                          |          |          |          |          |
| CO1                                                                                                                                                                                                      | Have a fundamental knowledge on the planning, different codes of practice, details and sequence of building construction |          |          |          |          |
| CO2                                                                                                                                                                                                      | Have knowledge on temporary structures such as scaffolding, underpinning and formwork structures in construction         |          |          |          |          |
| CO3                                                                                                                                                                                                      | Will have the ability to understand the principles, types, merits & demerits of Prefabrication of structures             |          |          |          |          |
| CO4                                                                                                                                                                                                      | Will have the knowledge of manufacture, batching, mixing, transporting, placing, compaction of concrete                  |          |          |          |          |
| CO5                                                                                                                                                                                                      | Will acquire knowledge on handling of different types of construction equipments                                         |          |          |          |          |

| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                |   |                             |   |                    |                        |                    |                         |   |                    |                                              |   |
|-----------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|-------------------------|---|--------------------|----------------------------------------------|---|
| 1                                                                                                                           | COs/POs  | a                                                              | b | c                           | d | e                  | f                      | g                  | h                       | i | j                  | k                                            | l |
|                                                                                                                             | CO1      | H                                                              |   |                             | M | H                  |                        | M                  |                         |   | M                  |                                              | M |
|                                                                                                                             | CO2      |                                                                |   | M                           |   |                    |                        |                    |                         |   |                    |                                              |   |
|                                                                                                                             | CO3      | M                                                              |   |                             | H |                    |                        |                    |                         |   | M                  |                                              |   |
|                                                                                                                             | CO4      |                                                                |   |                             |   | H                  |                        | H                  |                         |   |                    |                                              |   |
|                                                                                                                             | CO5      | H                                                              |   |                             |   |                    |                        |                    |                         |   | H                  |                                              |   |
| 3                                                                                                                           | Category | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |
|                                                                                                                             |          |                                                                |   |                             |   |                    | √                      |                    |                         |   |                    |                                              |   |
| 4                                                                                                                           | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |                        |                    |                         |   |                    |                                              |   |

## UNIT I PLANNING

9

Principles of Planning - regulations and byelaws, different codes of practice – Indian, American, & British codes of practice – Preparation of layouts - Orientation of Buildings- Specifications - details and sequence of construction – co-ordination – site clearance – marking (setting out)- Earthwork excavations – timbering – Dewatering

## UNIT II TEMPORARY STRUCTURE & SHELL STRUCTURES

9

Temporary shed - centering and shuttering – sheet piles, scaffoldings, shuttering forms – special forms for shells – slip form, moving form- shoring, and under pinning.

## UNIT III PREFABRICATION

9

Principles of prefabrication – Types – materials for prefabrication- standardization – systems – modular - co – ordination- production, transportation-erection-merits & demerits.

## UNIT IV CONCRETE

9

Process of manufacture of concrete, batching, mixing, transporting, placing, compaction, and curing concrete with admixtures.

## UNIT V CONSTRUCTION EQUIPMENTS

9

Selection of equipment for earth work, concreting, paving, pile erection- Material handling, hauling and erection of structures – Dewatering and pumping equipments.

## TEXT BOOKS :

1. Sheety, M.S, Concrete Technology, Theory and Practice, S. Chand and Company Ltd, New Delhi, 2005.

## REFERENCES:

1. Pourifoy R.L., "Formwork for concrete structures", McGraw Hill Co., 1999

2. Jha J. and Sinha S.S., “Construction and Foundation Engineering”, Khanna Publishers, 1993.
3. Chudley.R, “Construction Technology” (Vol. I, II, III,& IV) ELBS / Longman Publishers (second Edition)
4. Arora S.P and Bindra S.P. “Building Construction, Planning Techniques and Materials of Construction”, Dhanpat Rai and sons 1997

|                                                                                                                                                                     |                                                                                                              |                                                                            |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
| BCE5L1                                                                                                                                                              |                                                                                                              | CONSTRUCTION ENGINEERING<br>LABORATORY                                     |   |                             |   |                    |                        | L                  | T | P                       | C |                    |                                              |
|                                                                                                                                                                     |                                                                                                              | Total Contact Hours - 45                                                   |   |                             |   |                    |                        | 0                  | 0 | 3                       | 2 |                    |                                              |
|                                                                                                                                                                     |                                                                                                              | Prerequisite – Basic Civil and Mechanical Engineering Practices Laboratory |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                     |                                                                                                              | Course Designed by – Dept of Civil Engineering                             |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| OBJECTIVES:                                                                                                                                                         |                                                                                                              |                                                                            |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| 1. To learn the principles and procedures of testing Concrete and Highway materials and to get hands on experience by conducting the tests and evolving inferences. |                                                                                                              |                                                                            |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| 2. To know about the fresh mixed concrete and experience by mixing a freshly mixed concrete.                                                                        |                                                                                                              |                                                                            |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| COURSE OUTCOMES (COs)                                                                                                                                               |                                                                                                              |                                                                            |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO1                                                                                                                                                                 | Have a fundamental knowledge of the basic test to be performed on the material used in the construction site |                                                                            |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO2                                                                                                                                                                 | Testing the aggregate material which is used in the laying pavement                                          |                                                                            |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO3                                                                                                                                                                 | Designing the mix of the concrete for various structures in construction.                                    |                                                                            |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO4                                                                                                                                                                 | To know about the freshly mixed concrete and check their workability by slump, consistency and compaction.   |                                                                            |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO5                                                                                                                                                                 | To know the ability of the bitumen and their properties for laying pavements.                                |                                                                            |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                         |                                                                                                              |                                                                            |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| 1                                                                                                                                                                   | COs/POs                                                                                                      | a                                                                          | b | c                           | d | e                  | f                      | g                  | h | i                       | j | k                  | l                                            |
|                                                                                                                                                                     | CO1                                                                                                          | H                                                                          |   |                             |   | M                  | M                      |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                     | CO2                                                                                                          |                                                                            |   |                             |   | M                  |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                     | CO3                                                                                                          |                                                                            | M | M                           |   |                    |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                     | CO4                                                                                                          | H                                                                          |   |                             | L | M                  |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                     | CO5                                                                                                          |                                                                            |   |                             |   |                    | M                      |                    |   |                         |   |                    |                                              |
| 3                                                                                                                                                                   | Category                                                                                                     | Humanities & Social Studies (HS)                                           |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                                                                     |                                                                                                              |                                                                            |   |                             |   |                    | √                      |                    |   |                         |   |                    |                                              |
| 4                                                                                                                                                                   | Approval                                                                                                     | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016             |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |

## UNIT I TESTS ON CEMENT

9

Specific gravity, fineness, specific surface, soundness, consistency, initial and **final setting time**, **compressive strength** of cement mortar.

**UNIT II TESTS ON AGGREGATES****12**

a. Tests to find salinity, organic content etc.

b. Size distribution of particles.

c. Specific gravity / voids ratio.

d. Bulking of Sand.

Particle size, shape, flakiness index, elongation index, sieve analysis, specific gravity, density, absorption test, crushing and impact strength of coarse aggregates and abrasion tests.

**UNIT III CONCRETE MIX DESIGN****6****UNIT IV TESTS ON FRESH AND HARDENED CONCRETE****12**

Slump test, Vee-Bee Test, Compaction factor test, Test on cubes and cylinders – Determination of Young's modulus, compressive strength, tensile strength (beam and cylinder).

**UNIT V HIGHWAY: TESTS ON BITUMINOUS MATERIALS AND MIXES** **6**

a. Penetration test on Bitumen

b. Ductility test on Bitumen

c. Softening point test on Bitumen or tar

d. Flash and fire point tests on bitumen cut back bitumen

e. Specific gravity test.

f. Viscosity test on black bitumen – cutback bitumen or tar (using orifice viscometer).

g. Marshall stability test on bituminous mix - preparation of bituminous mix and determination of density, voids, stability and flow values.

|                                                                                                                                |                                                |                                                                                      |   |   |   |   |   |   |   |   |   |   |   |
|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|
| BCE5L2                                                                                                                         | FLUID MECHANICS AND FLUID MACHINERY LAB        |                                                                                      |   |   |   |   |   | L | T | P | C |   |   |
|                                                                                                                                | Total Contact Hours - 45                       |                                                                                      |   |   |   |   |   | 0 | 0 | 3 | 2 |   |   |
|                                                                                                                                | Prerequisite – Fluid Mechanics                 |                                                                                      |   |   |   |   |   |   |   |   |   |   |   |
|                                                                                                                                | Course Designed by – Dept of Civil Engineering |                                                                                      |   |   |   |   |   |   |   |   |   |   |   |
| <b>OBJECTIVES:</b><br>Students should be able to verify the principles studied in theory by performing the experiments in lab. |                                                |                                                                                      |   |   |   |   |   |   |   |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                   |                                                |                                                                                      |   |   |   |   |   |   |   |   |   |   |   |
| CO1                                                                                                                            |                                                | Measure theoretical discharge in pipes, Venturimeter, orificemeter and notches       |   |   |   |   |   |   |   |   |   |   |   |
| CO2                                                                                                                            |                                                | Demonstrate and conduct experiment to find characteristic curves of various pumps    |   |   |   |   |   |   |   |   |   |   |   |
| CO3                                                                                                                            |                                                | Demonstrate and conduct experiment to find characteristic curves of various turbines |   |   |   |   |   |   |   |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low    |                                                |                                                                                      |   |   |   |   |   |   |   |   |   |   |   |
| 1                                                                                                                              | COs/POs                                        | a                                                                                    | b | c | d | e | f | g | h | i | j | k | l |
|                                                                                                                                | CO1                                            |                                                                                      | H |   |   |   |   |   |   |   |   |   |   |
|                                                                                                                                | CO2                                            |                                                                                      | H |   | M |   |   |   | M |   |   |   |   |
|                                                                                                                                | CO3                                            |                                                                                      | H |   |   |   | L |   |   |   |   |   |   |

|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                             |
|---|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---------------------------------------------|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/Seminar/ Internship (PR) |
|   |          |                                                                |                             |                    | √                      |                    |                         |                    |                                             |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                             |

## LIST OF EXPERIMENTS

### A) Fluid Mechanics Lab Experiments

1. Determination of flow through pipes, losses in pipes.
2. Calibration of Orifice Meter & Venturi Meter
3. Flow through Notches & weirs.
4. Flow Through open orifices: Calculation of Cd, Co & Cv
5. Buoyancy experiment, Metacentric- height
6. Calibration of Mouth Pieces- Constant & Variable Head Method
7. Impact of jet on Vanes: inclined, curved.
8. Verification of Bernoulli's equation.

### B) Fluid Machinery Lab Experiments

1. Performance characteristics of Centrifugal Pump.
2. Performance characteristics of Multistage Pump
3. Performance characteristics of Gear Pump
4. Performance characteristics of Reciprocating Pump
5. Performance characteristics of Impulse Turbine
6. Performance characteristics of Reaction Turbine.
7. Performance characteristics of Jet Pump
8. Performance characteristics of Vane Pump

## REFERENCES:

1. Modi P.N & Sethi S.M "Hydraulics and Hydraulic Mechanics". Standard, Publishing Co, New Delhi.

| BCE5C1                                                                                                                                                                                                                                                                                                                                                                                                                                               | COMPREHENSION I                                                         | L | T | P | C |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|---|---|---|---|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Total Contact Hours : Test will be conducted at the end of the semester | 0 | 0 | 0 | 1 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Prerequisite – All the courses up to fifth semester                     |   |   |   |   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Course Designed by – Dept. Civil Engineering                            |   |   |   |   |
| OBJECTIVES                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                         |   |   |   |   |
| <ul style="list-style-type: none"><li>• To provide a complete review of Civil engineering topics covered up to fifth semesters, so that a comprehensive understanding is achieved.</li><li>• It will also help students to face job interviews, competitive examinations and also to enhance the employment potential.</li><li>• To provide overview of all topics covered and to assess the overall knowledge level up to fifth semester.</li></ul> |                                                                         |   |   |   |   |

|                                                                                                                             |          |                                                                      |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|-----------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------|---|-----------------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|----------------------------------------------|--|
| BCE601                                                                                                                      |          | STRUCTURAL ANALYSIS – II                                             |   |                             |   |                    |   |                        |   | L                  | T | P                       | C |                    |  |                                              |  |
|                                                                                                                             |          | Total Contact Hours - 60                                             |   |                             |   |                    |   |                        |   | 4                  | 0 | 0                       | 4 |                    |  |                                              |  |
|                                                                                                                             |          | Prerequisite – Structural Analysis – I                               |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                             |          | Course Designed by – Dept of Civil Engineering                       |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| OBJECTIVES:                                                                                                                 |          |                                                                      |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| To introduce the students to basic theory and concepts of structural analysis and methods for the analysis of structures.   |          |                                                                      |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| COURSE OUTCOMES (COs)                                                                                                       |          |                                                                      |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO1                                                                                                                         |          | Analyze Space Truss using tension Coefficient method                 |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO2                                                                                                                         |          | Analyze cable suspension bridges                                     |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO3                                                                                                                         |          | Perform plastic analysis of indeterminate beams and frames           |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO4                                                                                                                         |          | Analyze structures by using matrix flexibility and stiffness methods |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO5                                                                                                                         |          | Implement basic concepts of finite element analysis                  |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                      |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| 1                                                                                                                           | COs/POs  | a                                                                    | b | c                           | d | e                  | f | g                      | h | i                  | j | k                       | l |                    |  |                                              |  |
| 2                                                                                                                           | CO1      |                                                                      |   | M                           | H |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO2      |                                                                      |   | M                           | H |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO3      |                                                                      |   | M                           | H |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO4      |                                                                      |   | M                           | H |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO5      |                                                                      |   | M                           | H |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| 3                                                                                                                           | Category | Humanities & Social Studies (HS)                                     |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) |   | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) |  | Project/Term Paper/ Seminar/ Internship (DP) |  |
|                                                                                                                             |          |                                                                      |   |                             |   |                    |   | √                      |   |                    |   |                         |   |                    |  |                                              |  |
| 4                                                                                                                           | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016       |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |

## UNIT I ILD FOR INDETERMINATE STRUCTURES

12

Influence line for statically indeterminate structures – Maxwell Betti theorem - Muller – Breslau Principle and its application to determine the influence lines of reactions. SF and BM at a section of continuous beams – qualitative influence lines for horizontal thrust reaction and moments for continuous beams, portal and arches.

## UNIT II ARCHES & CABLES

12

Arches and suspension Cables : Three hinged and two hinged arches-parabolic and circular arches – influence lines for three and two hinged arches for horizontal thrust, SF and BM at any section - length of cable, maximum tension - types supports – forces in towers.

## UNIT III PLASTIC THEORY

12

Plastic Theory: Plastic moment of resistance - plastic modulus – shape factor – plastic hinges – determination of collapse load for continuous beams and portals.

#### UNIT V STIFFNESS METHOD

12

Matrix Method of Structural Analysis: Stiffness methods-development of stiffness method - stiffness matrix for continuous beams and portals application to simple pin jointed trusses, continuous beams, portal frames.

#### UNIT V FLEXIBILITY METHOD

12

Matrix method of Structural Analysis: Flexibility method – statically determinate and indeterminate (up to 2 degrees only) structures- formation of flexibility matrix - simple problems on Continuous beams, Portal frame.

#### TEXT BOOKS:

1. S.S.Bhavikati. Structural Analysis Vol.-I & II. Vikas Publishing House pvt ltd, 2009

#### REFERENCES:

1. William Weaver, Computer Programs for structural Analysis, VNR Publishers, 2006
2. Rubinstein M.F, Matrix Computer Analysis of Structures, Prentice Hall, Englewood cliffs, 1990
3. Arya AS. and Jain.” Theory and Analysis of Structures”, Nem Chand & Bros, Dec 1992
4. Pandit G S and Gupta S P,”Matrix methods in structural analysis”, Tata McGrawHill Publishing Company Limited, 2007

|                                                                                                                                          |         |                                                                              |   |   |   |   |   |   |   |   |   |   |   |
|------------------------------------------------------------------------------------------------------------------------------------------|---------|------------------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|
| BCE602                                                                                                                                   |         | REINFORCED CONCRETE STRUCTURES – II                                          |   |   |   |   |   | L | T | P | C |   |   |
|                                                                                                                                          |         | Total Contact Hours - 60                                                     |   |   |   |   |   | 4 | 0 | 0 | 4 |   |   |
|                                                                                                                                          |         | Prerequisite – Reinforced Concrete Structures – I                            |   |   |   |   |   |   |   |   |   |   |   |
|                                                                                                                                          |         | Course Designed by – Dept of Civil Engineering                               |   |   |   |   |   |   |   |   |   |   |   |
| OBJECTIVES:                                                                                                                              |         |                                                                              |   |   |   |   |   |   |   |   |   |   |   |
| To give an exposure to the design of continuous beams, slabs, staircases, walls and bridge structures and to introduce yield line theory |         |                                                                              |   |   |   |   |   |   |   |   |   |   |   |
| COURSE OUTCOMES (COs)                                                                                                                    |         |                                                                              |   |   |   |   |   |   |   |   |   |   |   |
| CO1                                                                                                                                      |         | Design counter-fort and cantilever retaining walls                           |   |   |   |   |   |   |   |   |   |   |   |
| CO2                                                                                                                                      |         | Design underground and overhead water tanks                                  |   |   |   |   |   |   |   |   |   |   |   |
| CO3                                                                                                                                      |         | Design bridges and flat slab                                                 |   |   |   |   |   |   |   |   |   |   |   |
| CO4                                                                                                                                      |         | Different methods and systems – uniform and non-uniform pre-stressing design |   |   |   |   |   |   |   |   |   |   |   |
| CO5                                                                                                                                      |         | Design Slab using yield line theory                                          |   |   |   |   |   |   |   |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low              |         |                                                                              |   |   |   |   |   |   |   |   |   |   |   |
| 1                                                                                                                                        | COs/POs | a                                                                            | b | c | d | e | f | g | h | i | j | k | l |
| 2                                                                                                                                        | CO1     |                                                                              |   | H | M |   |   |   |   |   |   |   |   |
|                                                                                                                                          | CO2     |                                                                              |   | H | M |   |   |   |   |   |   |   |   |

|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                              |  |  |  |  |
|---|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|----------------------------------------------|--|--|--|--|
|   | CO3      |                                                                |                             | H                  | M                      |                    |                         |                    |                                              |  |  |  |  |
|   | CO4      |                                                                |                             | H                  | M                      |                    |                         |                    |                                              |  |  |  |  |
|   | CO5      |                                                                |                             | H                  | M                      |                    |                         |                    |                                              |  |  |  |  |
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |  |  |  |  |
|   |          |                                                                |                             |                    | √                      |                    |                         |                    |                                              |  |  |  |  |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                              |  |  |  |  |

### UNIT I RETAINING WALLS 12

Retaining Walls – Design of cantilever and counter fort types using working stress method.

### UNIT II WATER TANKS 13

Water Tanks – Underground rectangular tanks – Domes – overhead circular and rectangular tanks – Design of staging and foundations.

### UNIT III BRIDGES 13

Bridges – slab Bridge – Distribution of concentrated loads by effective width and Pigeaud's method. Load distribution in interconnected girders by Courbon's method – T – Beam Bridge.

### UNIT IV PRE STRESSED CONCRETE 11

Principles of Pre-stressing – Materials for pre-stressed Concrete – Different methods and systems – uniform and non-uniform pre-stressing – losses in pre-stress – Analysis of simply supported beams with straight and parabolic tendons.

### UNIT V YIELD LINE THEORY 11

Yield Line Theory: Application of virtual work method to square, rectangular, and Triangular slabs.

#### TEXT BOOKS:

1. N.Krishnaraju, Design of R.C.Structures, CBS Publishers and Distributors. Delhi, 1989

#### REFERENCE BOOKS:

1. Mac Ginley, T.J. Reinforced Concrete Design, Theory and Examples, E and N.Spon. United London, 1978
2. Jaikrishna and Jain O.P, Plain and Reinforced Concrete Vol. I & II",Nem Chand & Bros., 1958
3. Krishna Raju N, Bridge Engineering" Oxford and IBH Publishing,2010
4. Park R. and Paulay T. Reinforced Concrete Structures John Wiley and Sons, 1975.
5. Neville A.M. Properties of Concrete, Pitman Pub., 1981

|               |                               |          |          |          |          |
|---------------|-------------------------------|----------|----------|----------|----------|
| <b>BCE603</b> | <b>IRRIGATION ENGINEERING</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|               | Total Contact Hours - 45      | 3        | 0        | 0        | 3        |

|                                                                                                                                                                                                                                                                      |          |                                                                         |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|-------------------------|--------------------|----------------------------------------------|---|---|
|                                                                                                                                                                                                                                                                      |          | Prerequisite – Fluid Mechanics                                          |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
|                                                                                                                                                                                                                                                                      |          | Course Designed by – Dept of Civil Engineering                          |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| <b>OBJECTIVES:</b>                                                                                                                                                                                                                                                   |          |                                                                         |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| To expose the student to different phases in Water Resources Management and National Water Policy. Further they will be imparted required knowledge on Reservoir planning, management and economic analysis including Irrigation and Irrigation management practices |          |                                                                         |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                                                                                                         |          |                                                                         |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| CO1                                                                                                                                                                                                                                                                  |          | Estimate water requirements for irrigation and drinking                 |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| CO2                                                                                                                                                                                                                                                                  |          | Estimate consumptive use of water for irrigation                        |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| CO3                                                                                                                                                                                                                                                                  |          | Perform water resources and prepare water budget                        |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| CO4                                                                                                                                                                                                                                                                  |          | Prepare irrigation scheduling and water distribution for various crops. |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| CO5                                                                                                                                                                                                                                                                  |          | Design cross drainage works                                             |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                                                                                                                          |          |                                                                         |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| 1                                                                                                                                                                                                                                                                    | COs/POs  | a                                                                       | b | c                           | d | e                  | f                      | g                  | h                       | i                  | j                                            | k | l |
| 2                                                                                                                                                                                                                                                                    | CO1      | M                                                                       |   |                             | H |                    |                        |                    |                         |                    |                                              |   |   |
|                                                                                                                                                                                                                                                                      | CO2      | M                                                                       |   |                             | H |                    |                        |                    |                         |                    |                                              |   |   |
|                                                                                                                                                                                                                                                                      | CO3      | M                                                                       |   |                             | H |                    |                        |                    |                         |                    |                                              |   |   |
|                                                                                                                                                                                                                                                                      | CO4      | M                                                                       |   | H                           | H |                    |                        |                    |                         |                    |                                              |   |   |
|                                                                                                                                                                                                                                                                      | CO5      | M                                                                       |   |                             | H |                    |                        |                    |                         |                    |                                              |   |   |
| 3                                                                                                                                                                                                                                                                    | Category | Humanities & Social Studies (HS)                                        |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |   |
|                                                                                                                                                                                                                                                                      |          |                                                                         |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |
| 4                                                                                                                                                                                                                                                                    | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016          |   |                             |   |                    |                        |                    |                         |                    |                                              |   |   |

## UNIT I IRRIGATION AS A SCIENCE

9

Definition, Need, Benefit, Historical Development, Scope in the country and the state - Sources for irrigation, wells, springs, rivers, streams, tanks, reservoirs - Flow and Lift irrigation. Methods of flow irrigation - Devices and equipments for lift irrigation - Duty, different concepts of duty and factors affecting duty.

## UNIT II CROP WATER REQUIREMENTS

9

Soil – plant – water relationship – Evapo transpiration – consumptive use - Perennial, Annual and Seasonal crops - Principal irrigated, dry and wet irrigated crops - Assessment of crop water requirements - Effective rainfall - Net irrigation requirements for principal crops -Irrigational quality - Salt resistant crops - Water logging, remedial measures.

## UNIT III CONVEYANCE AND DISTRIBUTION OF IRRIGATION WATER

9

Head works – Diversion and storage structures -Canals unlined and lined. Canal alignments - contour ridge, Branch canals, minors, water course and notches - Control structures - drops,

escapes, shutters and operating devices, division boxes - Cross drainage structures- under tunnels, aqueducts, siphons, siphon aqueducts - Cross masonry structures - road and railway bridges.

#### **UNIT IV IRRIGATION WATER MANAGEMENT**

**9**

Need for optimization of water use - Management and productivity - Minimizing irrigation water losses - Operational rules for regulation - physical structures for management on farm development works - Participatory Irrigation Management (PIM) - Water Users Associations (WUA) - Training the water users.

#### **UNIT V DESIGN OF IRRIGATION STRUCTURES**

**9**

Sluices and surplus weirs in tanks - Earth dam section, homogenous and zoned. Anicuts and weirs on solid and permeable foundation - Head regulators, canal drops, canal siphons and aqueducts, under tunnels - Simple design of masonry and earth dams- Designing channels- Computer aided designs.

#### **TEXT BOOKS:**

1. Sharma R.K, "Irrigation Engineering and Hydraulic Structures", Oxford and IBII Publishing Company, New Delhi, 2002.
2. Sathyanarayanan Murthy, "Irrigation Design and Drawing", Published by Mrs.L.Banumathi, Tuni, East Godavari District. A.P. 1998.

#### **REFERENCES:**

1. Michael A.M,"Irrigation – Theory and practice", Vikas Publishing House, 2000.
2. Hand Book on irrigation system operation Practices, Water Management and training Project Technical Report No.33. CWC, 1990.
3. Hand Book for improving Irrigation System Maintenance Practices, Water Management and Training Report No.19A, CWC, Delhi, 1989.

| <b>BSS601</b>                                                                                                                                                                                                                                                                            | <b>VALUE EDUCATION AND PROFESSIONAL ETHICS</b>                                                        | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------|----------|----------|----------|
|                                                                                                                                                                                                                                                                                          | Total Contact Hours - 45                                                                              | 3        | 0        | 0        | 3        |
|                                                                                                                                                                                                                                                                                          | Prerequisite – Professional Courses                                                                   |          |          |          |          |
|                                                                                                                                                                                                                                                                                          | Course Designed by – Dept of Management Studies                                                       |          |          |          |          |
| <b>OBJECTIVES</b>                                                                                                                                                                                                                                                                        |                                                                                                       |          |          |          |          |
| <ul style="list-style-type: none"> <li>- To teach the philosophy of Life, personal value, social value, mind cultural value and personal health</li> <li>- To teach professional ethical values, codes of ethics, responsibilities, safety, rights and related global issues.</li> </ul> |                                                                                                       |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                                                                                                                             |                                                                                                       |          |          |          |          |
| CO1                                                                                                                                                                                                                                                                                      | To learn about philosophy of Life and Individual qualities                                            |          |          |          |          |
| CO2                                                                                                                                                                                                                                                                                      | To learn and practice social values and responsibilities                                              |          |          |          |          |
| CO3                                                                                                                                                                                                                                                                                      | To learn and practice mind culture, forces acting on the body and causes of diseases and their curing |          |          |          |          |

|     |                                                                                           |
|-----|-------------------------------------------------------------------------------------------|
| CO4 | To learn more of Engineer as Responsible Experimenter.                                    |
| CO5 | To learn more of Risk and Safety assessment with case studies.                            |
| CO6 | To learn more of Responsibilities and Rights as Professional and facing Global Challenges |

#### **UNIT I : PHILOSOPHY OF LIFE AND INDIVIDUAL QUALITIES 9**

Human Life on Earth - Purpose of Life, Meaning and Philosophy of Life. The Law of Nature – Protecting Nature /Universe. Basic Culture - Thought Analysis - Regulating desire - Guarding against anger - To get rid of Anxiety – The Rewards of Blessing - Benevolence of Friendship - Love and Charity - Self – tranquility/Peace

#### **UNIT II : SOCIAL VALUES (INDIVIDUAL AND SOCIAL WELFARE) 9**

Family - Peace in Family, Society, The Law of Life Brotherhood - The Pride of Womanhood – Five responsibilities/duties of Man : - a) to himself, b) to his family, c) to his environment, d) to his society, e) to the Universe in his lives, Thriftness (Thrift)/Economics. Health - Education - Governance - People's Responsibility / duties of the community, World peace.

#### **UNIT III: MIND CULTURE & TENDING PERSONAL HEALTH 9**

Mind Culture - Life and Mind - Bio - magnetism, Universal Magnetism (God –Realization and Self Realization) - Genetic Centre – Thought Action – Short term Memory – Expansiveness – Thought – Waves, Channelizing the Mind, Stages - Meditation, Spiritual Value. Structure of the body - the three forces of the body- life body relation, natural causes and unnatural causes for diseases, Methods in Curing diseases

#### **UNIT IV: ENGINEERING AS SOCIAL EXPERIMENTATION AND ENGINEERS'S RESPONSIBILITIES FOR SAFETY 9**

Engineering as Experimentation – Engineer as Responsible Experimenters – Codes of Ethics – The Challenger, case study. Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – The Three Mile Island and Chernobyl case studies.

#### **UNIT V: ENGINEERS'S RESPONSIBILITIES FOR RIGHTS AND GLOBAL ISSUES 9**

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Whistle Blowing – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination. Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development –Engineers as Managers – Consulting Engineers – Engineers as Expert Eye Witnesses and Advisors – Moral Leadership

#### **TEXTBOOKS:**

1. Value Education for Health, Happiness and Harmony, The World Community Service, Centre Vethathiri Publications (Unit 1 – III).
2. Mike W Martin and Roland Schinzinger, Ethics In Engineering, Tata McGraw Hill, Newyork 2005 (Units IV & V)

#### **REFERENCE:**

1. Philosophy of Universal Magnetism (Bio - magnetism, Universal Magnetism) The World Community Service Centre Vethathiri Publications (for Unit III)

2. Thirukkural with English Translation of Rev. Dr. G.U. Pope, Uma Publication, 156, Serfoji Nagar, Medical College Road, Thanjavur 613 004 (for Units I - III)
3. R S Nagaarazan, Textbook On Professional Ethics And Human Values, New Age International Publishers, 2006 (for Units IV-V)
4. Charles D Fledderman, Engineering Ethics, Prentice Hall, New Mexico, 2004 (for Units IV-V)

|                                                                                                                                                                                                                           |          |                                                                  |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|----------|--------------------|----------------------------------------------|
| <b>BCE6L1</b>                                                                                                                                                                                                             |          | <b>COMPUTER AIDED BUILDING DRAWING</b>                           |   |                             |   |                    |                        |                    |   | <b>L</b>                | <b>T</b> | <b>P</b>           | <b>C</b>                                     |
|                                                                                                                                                                                                                           |          | Total Contact Hours - 45                                         |   |                             |   |                    |                        |                    |   | 0                       | 0        | 3                  | 2                                            |
|                                                                                                                                                                                                                           |          | Prerequisite – Computer Practices Lab                            |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
|                                                                                                                                                                                                                           |          | Course Designed by – Dept of Civil Engineering                   |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
| <b>OBJECTIVES:</b>                                                                                                                                                                                                        |          |                                                                  |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
| To introduce the students to draw the plan, elevation and sectional views of buildings in accordance with development and control rules satisfying orientation and functional requirements as per National Building Code. |          |                                                                  |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                                                              |          |                                                                  |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
| CO1                                                                                                                                                                                                                       |          | To study about drawing of Residential Building using Autocad     |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
| CO2                                                                                                                                                                                                                       |          | To study about drawing of RCC framed using Autocad               |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
| CO3                                                                                                                                                                                                                       |          | To study about drawing of office building using Autocad          |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
| CO4                                                                                                                                                                                                                       |          | To study about drawing of various types of Truss                 |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
| CO5                                                                                                                                                                                                                       |          | To Study about 3D drawing of a building using revit architecture |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                                                                               |          |                                                                  |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
| 1                                                                                                                                                                                                                         | COs/POs  | a                                                                | b | c                           | d | e                  | f                      | g                  | h | i                       | j        | k                  | l                                            |
| 2                                                                                                                                                                                                                         | CO1      |                                                                  |   |                             |   | M                  |                        |                    |   |                         |          |                    |                                              |
|                                                                                                                                                                                                                           | CO2      |                                                                  |   |                             |   | M                  |                        |                    |   |                         |          |                    |                                              |
|                                                                                                                                                                                                                           | CO3      |                                                                  |   |                             |   | M                  |                        |                    |   |                         |          |                    |                                              |
|                                                                                                                                                                                                                           | CO4      |                                                                  |   |                             |   | M                  |                        |                    |   |                         |          |                    |                                              |
|                                                                                                                                                                                                                           | CO5      |                                                                  |   |                             |   | M                  |                        |                    |   |                         |          |                    |                                              |
| 3                                                                                                                                                                                                                         | Category | Humanities & Social Studies (HS)                                 |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |          | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                                                                                                                           |          |                                                                  |   |                             |   |                    | √                      |                    |   |                         |          |                    |                                              |
| 4                                                                                                                                                                                                                         | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016   |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |

**Building Drawing in Accordance with Development and Control Rules Satisfying Orientation and Functional Requirements for the following:**

- |                                                             |   |
|-------------------------------------------------------------|---|
| 1. Residential buildings with load bearing walls (RCC roof) | 9 |
| 2. RCC framed structures                                    | 9 |

- |                                                                                          |   |
|------------------------------------------------------------------------------------------|---|
| 3. Office buildings (RCC roof)                                                           | 9 |
| 4. Industrial buildings – North light roof structures – Trusses –<br>Gantry arrangements | 9 |
| 5. Perspective view for small buildings                                                  | 9 |

**TEXT BOOKS:**

1. Verma B.P ,”Civil Engg. Drawing & House planning”, Khanna publishers, Delhi, 2014
2. Balagopal & Prabhu T S, “Building drawing & detailing”, Spades publishers, Calicut, 1984

**REFERENCES:**

1. M. G. Shah, C. M. Kale, S. Y. Patki , “Building drawing”, Tata McGraw-Hill, 2002
2. Kumaraswamy N, Kameswara Rao A, ”Building Planning & Drawing”, Charotar Publishing House, 1995

|                                                                                                                             |                                                                                                       |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|----------------------------------------------|---|---|---|---|
| BCE6L2                                                                                                                      |                                                                                                       | ENVIRONMENTAL ENGINEERING LAB                                  |                             |                    |                        |                    |                         |                    |                                              | L | T | P | C |
|                                                                                                                             |                                                                                                       | Total Contact Hours - 45                                       |                             |                    |                        |                    |                         |                    |                                              | 0 | 0 | 3 | 2 |
|                                                                                                                             |                                                                                                       | Prerequisite – Physics and Chemistry Laboratory-I              |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
|                                                                                                                             |                                                                                                       | Course Designed by – Dept of Civil Engineering                 |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| OBJECTIVES:                                                                                                                 |                                                                                                       |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| To understand the sampling and preservation methods and significance of characterization of wastewater.                     |                                                                                                       |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| COURSE OUTCOMES (COs)                                                                                                       |                                                                                                       |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| CO1                                                                                                                         | Have a fundamental knowledge to conduct various quality tests on water and wastewater                 |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| CO2                                                                                                                         | Have a well-founded knowledge to assess the suitability of water for drinking and irrigation purpose. |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| CO3                                                                                                                         | Acquire skills in assessing the suitability of water for concreting works                             |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                       |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| 1                                                                                                                           | COs/POs                                                                                               | a                                                              | b                           | c                  | d                      | e                  | f                       | g                  | h                                            | i | j | k | l |
| 2                                                                                                                           | CO1                                                                                                   |                                                                | H                           | M                  |                        | M                  |                         |                    |                                              |   |   |   |   |
|                                                                                                                             | CO2                                                                                                   |                                                                | H                           | M                  |                        | M                  |                         |                    |                                              |   |   |   |   |
|                                                                                                                             | CO3                                                                                                   |                                                                | H                           | M                  |                        | M                  |                         |                    |                                              |   |   |   |   |
| 3                                                                                                                           | Category                                                                                              | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |   |   |   |
|                                                                                                                             |                                                                                                       |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| 4                                                                                                                           | Approval                                                                                              | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |

**LIST OF EXPERIMENTS:**

1. a. Determination of pH.  
b. Determination of Turbidity
2. Determination of hardness.
3. Determination of Alkalinity.
4. Determination of Residual Chlorine
5. Estimation of Chlorides.
6. Estimation of Ammonia Nitrogen.
7. Estimation of Sulphate.
8. Determination of optimum coagulant dose.
9. Determination specific conductivity.
10. Estimation of available chlorine in Bleaching Powder.
11. Determination of dissolved Oxygen.
12. Determination of suspended settleable, Volatile and fixed solids.
13. B.O.D.Test
14. C.O.D.Test

**REFERENCES:**

1. Trivedhi and Goel. Chemical and Biological Methods for Water Pollution studies.
2. A Course manual – Water and Waste Water Analysis, national Environmental Engineering
3. Research Institute Nagpur Publication.
4. Standard Methods for Examination of Water and Wastewater - APHA, AWAA and WPCF, 1985 Edition.

|                                                                                                                                   |                                                                                 |  |  |   |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|--|--|---|---|---|---|
| BCE6P1                                                                                                                            | TERM PAPER                                                                      |  |  | L | T | P | C |
|                                                                                                                                   | Total Contact Hours – 60                                                        |  |  | 0 | 0 | 4 | 2 |
|                                                                                                                                   | Prerequisite – Professional Courses                                             |  |  |   |   |   |   |
|                                                                                                                                   | Lab Manual Prepared by – Dept of Civil Engineering                              |  |  |   |   |   |   |
| <b>OBJECTIVES</b>                                                                                                                 |                                                                                 |  |  |   |   |   |   |
| To teach the student the procedures and methodologies for understanding the literature survey and preparation for research paper. |                                                                                 |  |  |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                      |                                                                                 |  |  |   |   |   |   |
| CO1                                                                                                                               | To identify the area of research.                                               |  |  |   |   |   |   |
| CO2                                                                                                                               | To prepare list of literatures in the relevant area.                            |  |  |   |   |   |   |
| CO3                                                                                                                               | Compile the abstract from the literatures.                                      |  |  |   |   |   |   |
| CO4                                                                                                                               | Focus the search to a well defined theme and title.                             |  |  |   |   |   |   |
| CO5                                                                                                                               | Make and exhaustive report by compiling all the literatures that students       |  |  |   |   |   |   |
| CO6                                                                                                                               | To prepare a research paper for publications in journal/conference proceedings. |  |  |   |   |   |   |

**LIST OF TASKS****1. PREPARING PROPOSAL**

Proposed Research Topic

Purposes

Background

Method: (suggested methods – develop your own to suit your research topic)

## 2. CONDUCTING LITERATURE REVIEW

Exploring and Sharpening your Topic  
Evaluating Information  
Taking Notes and Keeping Records

## 3. COMPLETING ANNOTATED BIBLIOGRAPHY

Citing Your Sources and Avoiding Plagiarism  
Writing and Annotated Bibliography

## 4. IDENTIFYING PROBLEM STATEMENT

Meeting the Challenges of Research  
Developing New Information

## 5. COMPLETING OUTLINE FOR THE RESEARCH

Organizing Your Project into an outline  
Pick up your critique paper and begin editing and incorporate the suggestions from guide

## 6. SUBMITTING FIRST DRAFT

Drafting your Project  
Entering Conversations and Supporting Your Claims

## 7. SUBMITTING WORKS CITED

Create the individual citations  
Apply the formatting rules

## 8. SUBMITTING FULL PAPER

Revising, Editing, and Proofreading  
Designing and Presenting Your Project  
Conducting Research in the Disciplines  
Documenting Sources

### **REFERENCES:**

1. Website.
2. Printed Journals.

|                                                                                                                                                                                                                                                                                                                                                            |                                                |          |          |          |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|----------|----------|----------|----------|
| <b>BCE701</b>                                                                                                                                                                                                                                                                                                                                              | <b>ESTIMATION AND COSTING</b>                  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                                                                                                                                                                                                                                                                            | Total Contact Hours - 45                       | 3        | 0        | 0        | 3        |
|                                                                                                                                                                                                                                                                                                                                                            | Prerequisite - Building Construction           |          |          |          |          |
|                                                                                                                                                                                                                                                                                                                                                            | Course Designed by – Dept of Civil Engineering |          |          |          |          |
| <b>OBJECTIVES:</b><br>To provide the student with the ability to estimate the quantities of item of works involved in buildings, water supply and sanitary works, road works and irrigation works, and also to equip the student with the ability to do rate analysis, valuation of properties and preparation of reports for estimation of various items. |                                                |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                                                                                                                                                                                               |                                                |          |          |          |          |

|                                                                                                                             |                                                                                                             |                                                                |   |                             |                    |                        |                    |   |                         |   |                    |   |                                              |
|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|---|-----------------------------|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|---|----------------------------------------------|
| CO1                                                                                                                         | Will have a basic knowledge on methods and types of estimation and its merits and demerits                  |                                                                |   |                             |                    |                        |                    |   |                         |   |                    |   |                                              |
| CO2                                                                                                                         | Have knowledge on specifications and tendering process for contracts                                        |                                                                |   |                             |                    |                        |                    |   |                         |   |                    |   |                                              |
| CO3                                                                                                                         | Will have the ability to understand the types, formation, terms and conditions in contracts and arbitration |                                                                |   |                             |                    |                        |                    |   |                         |   |                    |   |                                              |
| CO4                                                                                                                         | Will have the knowledge of rate analysis of different item of work and MB and bill of quantities            |                                                                |   |                             |                    |                        |                    |   |                         |   |                    |   |                                              |
| CO5                                                                                                                         | Will able to value a property, price escalation recommendations and auditing                                |                                                                |   |                             |                    |                        |                    |   |                         |   |                    |   |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                             |                                                                |   |                             |                    |                        |                    |   |                         |   |                    |   |                                              |
| 1                                                                                                                           | COs/POs                                                                                                     | a                                                              | b | c                           | d                  | e                      | f                  | g | h                       | i | j                  | k | l                                            |
| 2                                                                                                                           | CO1                                                                                                         | H                                                              |   |                             | M                  | H                      |                    | M |                         |   | M                  |   | M                                            |
|                                                                                                                             | CO2                                                                                                         |                                                                |   | M                           |                    |                        |                    |   |                         |   |                    |   |                                              |
|                                                                                                                             | CO3                                                                                                         | M                                                              |   |                             | H                  |                        |                    |   |                         |   | M                  |   |                                              |
|                                                                                                                             | CO4                                                                                                         |                                                                |   |                             |                    | H                      |                    | H |                         |   |                    |   |                                              |
|                                                                                                                             | CO5                                                                                                         | H                                                              |   |                             |                    |                        |                    |   |                         |   | H                  |   |                                              |
| 3                                                                                                                           | Category                                                                                                    | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) |   | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                             |                                                                                                             |                                                                |   |                             |                    |                        |                    |   |                         |   |                    |   |                                              |
| 4                                                                                                                           | Approval                                                                                                    | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |                    |                        |                    |   |                         |   |                    |   |                                              |

## UNIT I ESTIMATION

9

Purpose – Methods of estimation – advantages – types of estimates – detailed estimates of residential buildings – single storied and multistoried buildings – earthwork – foundations – Super structure – Fittings including sanitary and electrical fittings – paintings.

## UNIT II SPECIFICATIONS AND TENDERS

9

Specifications – Detailed and general specifications – construction specifications – sources – types of specifications – **Tender notices** – types – corrigendum notice – tender procedures – Drafting model tenders

## UNIT III CONTRACTS

9

Contract – types of contracts – formation of contract – contract conditions – contract problems – contract for **labor, material, design and construction** – drafting of contract documents – construction contracts – arbitration and legal requirements.

## UNIT IV RATE ANALYSIS AND PREPARATION OF BILLS

9

Data – Rate analysis – abstract estimate – **report to accompany estimate** – measurement book – bills – types

## UNIT V VALUATION

9

Basic – Principles of valuation – Value and Cost – value engineering – value analysis – phases in value engineering – information – function – **escalation – evaluation – recommendation implementation – Audit**

**TEXT BOOK:**

1. Estimating and costing in Civil Engineering –Dutta B.N & Dutta S UBS Publishers & Distributors Pvt. Company, Lucknow 1986

**REFERENCES:**

1. Kohli, D.D and Kohli, R.C., “A Text Book of Estimating and Costing (Civil)”, S.Chand & Company Ltd., 2004
2. Birdie G.S. “A text book on estimating and costing” — Dhanpat Rai and Sons, New Delhi.
3. Jagannathan G, Getting more at less cost – The Value Engineering Way, Tata McGraw Hill, New Delhi, 1992.

|                                                                                                                                               |          |                                                                           |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
|-----------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|---|
| BCE702                                                                                                                                        |          | COMPUTER AIDED DESIGN OF STRUCTURES                                       |   |                             |   |                    |                        |                    |   |                         | L | T                  | P                                            | C |
|                                                                                                                                               |          | Total Contact Hours - 60                                                  |   |                             |   |                    |                        |                    |   |                         | 4 | 0                  | 0                                            | 4 |
|                                                                                                                                               |          | Prerequisite -Computer Aided Building Drawing                             |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
|                                                                                                                                               |          | Course Designed by – Dept of Civil Engineering                            |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| OBJECTIVES:                                                                                                                                   |          |                                                                           |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| To introduce the students about computer graphics, structural analysis, design and optimization and expert systems, applications in analysis. |          |                                                                           |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| COURSE OUTCOMES (COs)                                                                                                                         |          |                                                                           |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO1                                                                                                                                           |          | Prepare wire frame modeling and solid modeling using drafting packages    |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO2                                                                                                                                           |          | Perform structural analysis using computer packages                       |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO3                                                                                                                                           |          | Prepare algorithms for the analysis and design of steel and RC structures |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO4                                                                                                                                           |          | Analysis simple structures using expert systems                           |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO5                                                                                                                                           |          | Analysis and design of structures by using STADD.PRO, STRAP               |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                   |          |                                                                           |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| 1                                                                                                                                             | COs/POs  | a                                                                         | b | c                           | d | e                  | f                      | g                  | h | i                       | j | k                  | l                                            |   |
| 2                                                                                                                                             | CO1      | H                                                                         |   | H                           | H | H                  |                        |                    |   |                         |   |                    |                                              |   |
|                                                                                                                                               | CO2      |                                                                           |   | H                           | H | H                  |                        |                    |   |                         |   |                    |                                              |   |
|                                                                                                                                               | CO3      |                                                                           |   | H                           | H |                    |                        |                    |   |                         | M |                    |                                              |   |
|                                                                                                                                               | CO4      |                                                                           |   | H                           | H | H                  |                        | L                  |   |                         |   |                    |                                              |   |
|                                                                                                                                               | CO5      |                                                                           |   | H                           | H | H                  |                        |                    |   |                         |   |                    |                                              |   |
| 3                                                                                                                                             | Category | Humanities & Social Studies (HS)                                          |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |
|                                                                                                                                               |          |                                                                           |   |                             |   |                    | √                      |                    |   |                         |   |                    |                                              |   |
| 4                                                                                                                                             | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016            |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |

- UNIT I INTRODUCTION & COMPUTER GRAPHICS 10**  
 Introduction to computer graphics - Fundamentals of CAD – Hardware and software requirements – Design process – Applications and benefits – drafting packages- use of AUTOCAD – application to layout of buildings and structures - graphic primitives – wireframe modeling and solid modeling.
- UNIT II DESIGN & OPTIMIZATION 12**  
 Design and Optimization: Optimization techniques – principles of design of steel and RCC structures - applications to simple design problems.
- UNIT III INTRODUCTION TO FINITE ELEMENT ANALYSIS 14**  
 Introduction of Finite Element Analysis: Fundamentals of finite element analysis – steps involved - boundary value problems, Galerkin’s approach – variation principles – finite element matrix - assemblage solution for deflections - stresses and strains - simple problems using triangular elements.
- UNIT IV ANALYSIS OF STRUCTURES BY FINITE ELEMENT METHOD 12**  
 Analysis of Structures by FEM: Analysis of plane truss, space truss, plane frame and space frame by using FEM packages – ANSYS – STRUDL – NASTRAN – SAP 2000.
- UNIT V STRUCTURAL ENGINEERING PACKAGES 12**  
 Structural Engineering Packages: Introduction of various structural engineering packages - analysis and design of structures by using STADD.PRO, STRAP.

**TEXT BOOKS:**

1. Krishna Raju, “Structural Design & Drawing (Concrete & Steel)”, CBS Publishers 2004.

**REFERENCES:**

1. Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, “Design of steel structures”, Lakshmi Publications Pvt. Ltd 2003.
2. Rajasekaran, S., Finite Element Analysis. AH Wheelers Publishing Company Ltd.,
3. Rao S.S.Optimization – Theory and Application, Wiley Eastern Ltd.
4. Auto CADD manual.

|                                                                                                                                      |                                                                                   |  |   |   |   |   |
|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--|---|---|---|---|
| BCE703                                                                                                                               | DESIGN OF STEEL STRUCTURES                                                        |  | L | T | P | C |
|                                                                                                                                      | Total Contact Hours - 60                                                          |  | 4 | 0 | 0 | 4 |
|                                                                                                                                      | Prerequisite -Basic Structural Design                                             |  |   |   |   |   |
|                                                                                                                                      | Course Designed by – Dept of Civil Engineering                                    |  |   |   |   |   |
| <b>OBJECTIVES:</b><br>This course deals with some of the special aspects with respect to Civil Engineering structures in industries. |                                                                                   |  |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                         |                                                                                   |  |   |   |   |   |
| CO1                                                                                                                                  | Design of plate girders, web and flange design, curtailment of flange plates.     |  |   |   |   |   |
| CO2                                                                                                                                  | Design of simple and built up columns subject to combined bending and axial loads |  |   |   |   |   |

|                                                                                                                             |          |                                                                                       |   |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |
|-----------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|---|----------------------------------------------|
| CO3                                                                                                                         |          | Design of flexural and compression members, Design of self supporting steel chimneys. |   |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |
| CO4                                                                                                                         |          | Design of overhead rectangular, cylindrical and pressed steel tanks                   |   |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |
| CO5                                                                                                                         |          | To study shape factor, plastic hinge ,plastic moment , plastic analysis of beams.     |   |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                                       |   |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |
| 1                                                                                                                           | COs/POs  | a                                                                                     | b | c                           | d | e                  | f                      | g                  | h | i                       | j | k                  | l |                                              |
| 2                                                                                                                           | CO1      | M                                                                                     |   | H                           | M |                    |                        |                    |   |                         |   |                    |   |                                              |
|                                                                                                                             | CO2      | M                                                                                     |   | H                           | M |                    |                        |                    |   |                         |   |                    |   |                                              |
|                                                                                                                             | CO3      | M                                                                                     |   | H                           | M |                    | M                      |                    |   |                         | L |                    |   |                                              |
|                                                                                                                             | CO4      | M                                                                                     |   | H                           | M |                    |                        |                    |   |                         |   |                    |   |                                              |
|                                                                                                                             | CO5      | M                                                                                     |   | H                           | M |                    |                        |                    |   |                         |   |                    |   |                                              |
| 3                                                                                                                           | Category | Humanities & Social Studies (HS)                                                      |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) |   | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                             |          |                                                                                       |   |                             |   |                    | √                      |                    |   |                         |   |                    |   |                                              |
| 4                                                                                                                           | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016                        |   |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |

### UNIT I PLATE GIRDER

12

Design of plate girders – web and flange design – curtailment of flange plates – Design of stiffeners and splices – Design of gantry girder.

### UNIT II COLUMNS SUBJECTED TO COMBINED BENDING AND AXIAL LOADS

12

Design of simple and built up columns subject to combined bending and axial loads - design of column base and connections to foundation.

### UNIT III LIGHT GAUGE STEEL SECTIONS

12

Behavior – Design of flexural and compression members – Design of self supporting steel chimneys.

### UNIT IV STEEL WATER TANKS

12

Design of overhead rectangular, cylindrical and pressed steel tanks including the design of staging and foundations.

### UNIT V PLASTIC THEORY

12

Shape factor – plastic hinge – plastic moment – plastic analysis of beams - design of beams.

|        |                                         |   |   |   |   |
|--------|-----------------------------------------|---|---|---|---|
| BCE7L1 | COMPUTER AIDED DESIGN OF STRUCTURES LAB | L | T | P | C |
|        | Total Contact Hours - 45                | 0 | 0 | 3 | 2 |

|                                                                                                                             |          |                                                                        |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
|-----------------------------------------------------------------------------------------------------------------------------|----------|------------------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
|                                                                                                                             |          | Prerequisite – Computer Aided Building Drawing                         |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                             |          | Course Designed by – Dept of Civil Engineering                         |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| <b>OBJECTIVES:</b>                                                                                                          |          |                                                                        |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| To introduce the students to analyze and design different structures like trusses, beams, frames etc.                       |          |                                                                        |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                |          |                                                                        |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO1                                                                                                                         |          | To Study about Microsoft office                                        |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO2                                                                                                                         |          | To Study about drawing of buildings using Autocad in 2D                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO3                                                                                                                         |          | To Study about drawing of buildings using Autocad in 3D                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO4                                                                                                                         |          | To Study about Modeling                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO5                                                                                                                         |          | To Study about 3D objects                                              |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO6                                                                                                                         |          | To Study about Solid Editing                                           |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO7                                                                                                                         |          | To Study about drawings of plans and layouts                           |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO8                                                                                                                         |          | To Study about various mode of drawing in Autocad                      |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO9                                                                                                                         |          | To Study about file management                                         |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO10                                                                                                                        |          | To Study about analysis of trusses and frame                           |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO11                                                                                                                        |          | To Study about analysis of different component in staad pro            |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO12                                                                                                                        |          | To Study about analysis and design of different component in staad pro |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                        |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| 1                                                                                                                           | COs/POs  | a                                                                      | b | c                           | d | e                  | f                      | g                  | h | i                       | j | k                  | l                                            |
| 2                                                                                                                           | CO1      |                                                                        |   |                             |   | M                  |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO2      |                                                                        |   |                             |   | M                  |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO3      |                                                                        |   |                             |   | M                  |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO4      |                                                                        |   |                             |   | M                  |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO5      |                                                                        |   |                             |   | M                  |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO6      |                                                                        |   |                             |   | M                  |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO7      |                                                                        |   |                             |   | M                  |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO8      |                                                                        |   |                             |   | M                  |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO9      |                                                                        |   |                             |   | M                  |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO10     |                                                                        |   |                             |   | M                  |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO11     |                                                                        |   |                             |   | M                  |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO12     |                                                                        |   |                             |   | M                  |                        |                    |   |                         |   |                    |                                              |
| 3                                                                                                                           | Category | Humanities & Social Studies (HS)                                       |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                             |          |                                                                        |   |                             |   |                    | √                      |                    |   |                         |   |                    |                                              |
| 4                                                                                                                           | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016         |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |

## LIST OF EXPERIMENTS

1. Preparation of Script and Slide presentation
2. Creating 2D drawings plan, elevation, section of residential buildings
3. Creating 3D drawings, preparation of elevation for multi storeyed buildings.
4. Surface modeling and solid modeling
5. 3D objects – construction and enhanced viewing
6. Solid Editing and real time 3D rotations
7. Working with layouts.
8. Modifying AUTOCAD environment and plotting
9. File management
10. Analysis of Plane truss space truss – plane frame – space frame and other elements such as plate elements and shell elements.
11. Analysis of different structural components by using STAAD.PRO – STRAP.
12. Analysis and design of different structural components by using STRAP – STAAD.PRO – STAAD etc.

|                                                                                                                                                                                                                                                                                                                        |                                                                                                           |   |   |   |   |   |   |   |   |   |   |   |   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| BCE7L2                                                                                                                                                                                                                                                                                                                 | COMPUTER AIDED DESIGN AND<br>DRAFTING LABORATORY<br>(R.C.C, Steel, Irrigation & Environment)              |   |   |   |   |   |   | L | T | P | C |   |   |
|                                                                                                                                                                                                                                                                                                                        | Total Contact Hours - 45                                                                                  |   |   |   |   |   |   | 0 | 0 | 3 | 2 |   |   |
|                                                                                                                                                                                                                                                                                                                        | Prerequisite – Computer Aided Building Drawing                                                            |   |   |   |   |   |   |   |   |   |   |   |   |
|                                                                                                                                                                                                                                                                                                                        | Course Designed by – Dept of Civil Engineering                                                            |   |   |   |   |   |   |   |   |   |   |   |   |
| OBJECTIVES:                                                                                                                                                                                                                                                                                                            |                                                                                                           |   |   |   |   |   |   |   |   |   |   |   |   |
| 1. The student shall be able to conceive, design and draw all types of irrigation structures in detail showing plan, elevation and sections.                                                                                                                                                                           |                                                                                                           |   |   |   |   |   |   |   |   |   |   |   |   |
| 2. This subject includes process design (excluding Structural Design) of major units associated with water and sewage treatment and transport including house building drainage. At the end of the course, the student is expected to know about the sizing of treatment plant units and draw the general arrangement. |                                                                                                           |   |   |   |   |   |   |   |   |   |   |   |   |
| 3. To understand the techniques for designing of reinforced concrete structures and steel structures                                                                                                                                                                                                                   |                                                                                                           |   |   |   |   |   |   |   |   |   |   |   |   |
| COURSE OUTCOMES (COs)                                                                                                                                                                                                                                                                                                  |                                                                                                           |   |   |   |   |   |   |   |   |   |   |   |   |
| CO1                                                                                                                                                                                                                                                                                                                    | Have a fundamental knowledge of the design of irrigation structures.                                      |   |   |   |   |   |   |   |   |   |   |   |   |
| CO2                                                                                                                                                                                                                                                                                                                    | Have a fundamental knowledge of the design of environmental works which can describe real life phenomena. |   |   |   |   |   |   |   |   |   |   |   |   |
| CO3                                                                                                                                                                                                                                                                                                                    | To learn about design and Drawing for concrete structures                                                 |   |   |   |   |   |   |   |   |   |   |   |   |
| CO4                                                                                                                                                                                                                                                                                                                    | To learn about design and Drawing for steel structures                                                    |   |   |   |   |   |   |   |   |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                                                                                                                                                                            |                                                                                                           |   |   |   |   |   |   |   |   |   |   |   |   |
| 1                                                                                                                                                                                                                                                                                                                      | COs/POs                                                                                                   | a | b | c | d | e | f | g | h | i | j | k | l |
| 2                                                                                                                                                                                                                                                                                                                      | CO1                                                                                                       | H |   | H |   |   |   | L |   | M |   | H |   |
|                                                                                                                                                                                                                                                                                                                        | CO2                                                                                                       | H |   | H |   |   |   | L |   | M |   | H |   |
|                                                                                                                                                                                                                                                                                                                        | CO3                                                                                                       | H |   | H |   |   |   | L |   | M |   | H |   |
|                                                                                                                                                                                                                                                                                                                        | CO4                                                                                                       | H | M | H |   | M |   | M |   | M |   | H |   |

|   |          |                                                                |                             |               |                        |                    |                         |                    |                                            |
|---|----------|----------------------------------------------------------------|-----------------------------|---------------|------------------------|--------------------|-------------------------|--------------------|--------------------------------------------|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/Seminar/Internship (PR) |
|   |          |                                                                |                             |               | ✓                      |                    |                         |                    |                                            |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |               |                        |                    |                         |                    |                                            |

### UNIT I

11

**Detailed design and drawing (Not to scale) of the following reinforced concrete structures.**

1. a. Typical building floors consisting of slabs and beams.
- b. Flat slabs using BIS code formula.
2. Isolated and combined footings.

### UNIT II

11

**Detailed design and drawing (Not to scale) of the following steel structures :**

1. a. Columns and base plate
- b. Grillage foundation
2. Plate Girder

### UNIT III

**Design of following irrigation works are to be worked out and drawing (Not to Scale) are to be drawn.**

12

1. Earthen Dams – Sections of different types of earth dams, plan showing drainage systems.
2. Tank Sluice Wing type
3. Tank Surplus Weir
4. Canal Regulator (Head regulator)

### UNIT IV

**Design of the following Environmental works are to be worked out and detailed drawing (Not to Scale) to be drawn.**

11

1. General layout of water supply scheme
2. Mixing basin, flocculation and sedimentation tanks
3. Slow and rapid sand filters – Service and clear water reservoirs

### TEXT BOOK:

1. Satyanarayana Murthy, “Irrigation Design and Drawing”, Published by Mrs. L. Banumathi, Tuni, East Godavari District, A.P. 1998
2. Punmia, B.C., Jain, A.K., and Jain.A., Environmental Engineering, Vol.I& Vol.II, Lakshmi Publications, Newsletter, 2005.

### REFERENCES:

1. Krishnamurthy D, Structural Design Drawing CBS Publication. New Delhi 1985.
2. Shah M.G & Kale C.M, Building Drawing to Built to Environment –Tata McGraw Hill Co.
3. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
4. Manual on Sewerage and Sewage Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1993.

5. H.S.Peavy, D.R.Rowe and George Tchobanoglous, Environmental Engineering McGrawHill Company, New Delhi, 1995.
6. Shah C.S, Water Supply and Sanitation, Galgotia Publishing Company, New Delhi 1994

|                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                         |   |   |   |   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|---|---|---|---|
| BCE8C1                                                                                                                                                                                                                                                                                                                                                                                                                                                 | COMPREHENSION II                                                        | L | T | P | C |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Total Contact Hours : Test will be conducted at the end of the semester | 0 | 0 | 0 | 1 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Prerequisite – All the courses upto eighth semester                     |   |   |   |   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Course Designed by – Dept. of Civil Engineering                         |   |   |   |   |
| OBJECTIVES                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                         |   |   |   |   |
| <ul style="list-style-type: none"><li>• To provide a complete review of Civil Engineering topics covered up to eighth semesters, so that a comprehensive understanding is achieved.</li><li>• It will also help students to face job interviews, competitive examinations and also to enhance the employment potential.</li><li>• To provide overview of all topics covered and to assess the overall knowledge level up to eighth semester.</li></ul> |                                                                         |   |   |   |   |

|                                                                                                                                                                                                                                                              |                                                                                     |          |          |          |          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------|----------|----------|----------|
| <b>BEC8P1</b>                                                                                                                                                                                                                                                | <b>PROJECT WORK</b>                                                                 | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                                                                                                                                                                              | Total Contact Hours –18 periods a week                                              | 0        | 0        | 18       | 9        |
|                                                                                                                                                                                                                                                              | Prerequisite –Term paper                                                            |          |          |          |          |
|                                                                                                                                                                                                                                                              | Course Designed by – Dept. of Civil Engineering.                                    |          |          |          |          |
| <b>OBJECTIVES</b> <ul style="list-style-type: none"><li>• Learn to work as a member of a project team.</li><li>• Understand project management tasks.</li><li>• Develop a hardware / software solution for a real-time, industry relevant problem.</li></ul> |                                                                                     |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                                                                                                 |                                                                                     |          |          |          |          |
| CO1                                                                                                                                                                                                                                                          | Apply knowledge of basic science and engineering to Civil Engineering problems      |          |          |          |          |
| CO2                                                                                                                                                                                                                                                          | Implement the simple applications and verify using modern simulation tools.         |          |          |          |          |
| CO3                                                                                                                                                                                                                                                          | Identify, formulate, and model engineering equipment                                |          |          |          |          |
| CO4                                                                                                                                                                                                                                                          | Recognize the real world applications and to solve with core engineering knowledge. |          |          |          |          |
| CO5                                                                                                                                                                                                                                                          | Analyze and work on multidisciplinary tasks                                         |          |          |          |          |
| CO6                                                                                                                                                                                                                                                          | Choose latest tools, software and equipment to solve real world problems            |          |          |          |          |

### CORE ELECTIVE – I

|                                                                                                                                                           |                                                                   |                                                                |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|----------|--------------------|----------------------------------------------|----------|
| <b>BCE051</b>                                                                                                                                             | <b>CONCRETE TECHNOLOGY</b>                                        |                                                                |   |                             |   |                    |                        |                    |   |                         | <b>L</b> | <b>T</b>           | <b>P</b>                                     | <b>C</b> |
|                                                                                                                                                           | Total Contact Hours - 45                                          |                                                                |   |                             |   |                    |                        |                    |   |                         | 3        | 0                  | 0                                            | 3        |
|                                                                                                                                                           | Prerequisite – Building Construction                              |                                                                |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |          |
|                                                                                                                                                           | Course Designed by – Dept of Civil Engineering                    |                                                                |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |          |
| <b>OBJECTIVES:</b><br>To study the properties of concrete making materials, tests, mix design, special concretes and various methods for making concrete. |                                                                   |                                                                |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                              |                                                                   |                                                                |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |          |
| CO1                                                                                                                                                       | To learn about concrete making material IS specifications.        |                                                                |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |          |
| CO2                                                                                                                                                       | To know about properties of fresh concrete and hardened concrete. |                                                                |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |          |
| CO3                                                                                                                                                       | To understand the principles and methods of concrete mix design   |                                                                |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |          |
| CO4                                                                                                                                                       | To know about the various types of special concrete.              |                                                                |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |          |
| CO5                                                                                                                                                       | To understand process of manufacturing of concrete.               |                                                                |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |          |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                               |                                                                   |                                                                |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |          |
| 1                                                                                                                                                         | COs/POs                                                           | a                                                              | b | c                           | d | e                  | f                      | g                  | h | i                       | j        | k                  | l                                            |          |
| 2                                                                                                                                                         | CO1                                                               | H                                                              |   | H                           | H |                    |                        |                    |   |                         |          |                    |                                              |          |
|                                                                                                                                                           | CO2                                                               | H                                                              | M | H                           | H | H                  |                        |                    |   |                         |          |                    |                                              |          |
|                                                                                                                                                           | CO3                                                               | H                                                              | M | H                           | H |                    | M                      |                    |   |                         |          |                    |                                              |          |
|                                                                                                                                                           | CO4                                                               | H                                                              |   | H                           | H |                    |                        |                    |   |                         |          |                    |                                              |          |
|                                                                                                                                                           | CO5                                                               | H                                                              | M | H                           | H | H                  |                        |                    |   |                         |          |                    |                                              |          |
| 3                                                                                                                                                         | Category                                                          | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |          | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |          |
|                                                                                                                                                           |                                                                   |                                                                |   |                             |   |                    |                        | √                  |   |                         |          |                    |                                              |          |
| 4                                                                                                                                                         | Approval                                                          | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |          |

#### UNIT I CONCRETE MAKING MATERIALS

9

Aggregates, IS Specifications, Properties, Grading, Methods of combining aggregates, specified grading. Cement, Grades of cement. Chemical composition, Hydration of cement, structure of hydrated cement, Special cements - Water Chemical admixtures. Mineral admixtures.

#### UNIT II CONCRETE

9

Properties of fresh concrete, Hardened concrete, Strength, Elastic properties, Creep and shrinkage. Variability of concrete strength. Concrete testing Methods: Non destructive tests ultrasonic pulse velocity, Rebound Hammer test. Pullout tests.

**UNIT III MIX DESIGN****9**

Principles of concrete mix design. Methods of concrete mix design. Indian standard Recommended Method. IS 10262-82

**UNIT IV SPECIAL CONCRETE****9**

Light Weight concrete, Fly ash concrete, Fibre reinforced concrete, Polymer Concrete, Super plasticised concrete, Epoxy resins and screeds for rehabilitation - Properties and Applications- High performance concrete.

**UNIT V CONCRETING METHODS****9**

Process of manufacturing of concrete, methods of transportation, placing and curing - Extreme weather concreting, special concreting methods. Vacuum dewatering underwatering concrete, Ready mix concentrate.

**REFERENCES:**

1. Neville, A.M. Properties of Concrete, Pitman Publishing Limited, Lnclon.
2. Shetty M.S., Concrete Technology, S. Chand and Company Ltd. Delhi.
3. RudhaniG., Light Weight Concrete Academic Kiado, Publishing HomeofHungarianAcademy of Science, 1963.

|                                                                                                                             |         |                                                             |   |   |   |   |   |   |   |   |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------|---------|-------------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|
| BCE052                                                                                                                      |         | INDUSTRIAL STRUCTURES                                       |   |   |   |   |   |   |   | L | T | P | C |
|                                                                                                                             |         | Total Contact Hours - 45                                    |   |   |   |   |   |   |   | 3 | 0 | 0 | 3 |
|                                                                                                                             |         | Prerequisite – Reinforced Concrete Structures - I           |   |   |   |   |   |   |   |   |   |   |   |
|                                                                                                                             |         | Course Designed by – Dept of Civil Engineering              |   |   |   |   |   |   |   |   |   |   |   |
| OBJECTIVES:                                                                                                                 |         |                                                             |   |   |   |   |   |   |   |   |   |   |   |
| This course deals with some of the special aspects with respect to Civil Engineering structures related to industries       |         |                                                             |   |   |   |   |   |   |   |   |   |   |   |
| COURSE OUTCOMES (COs)                                                                                                       |         |                                                             |   |   |   |   |   |   |   |   |   |   |   |
| CO1                                                                                                                         |         | Prepare the layout for industrial buildings                 |   |   |   |   |   |   |   |   |   |   |   |
| CO2                                                                                                                         |         | Design for functional requirements                          |   |   |   |   |   |   |   |   |   |   |   |
| CO3                                                                                                                         |         | Design steel girder, bunker and silos                       |   |   |   |   |   |   |   |   |   |   |   |
| CO4                                                                                                                         |         | Design RC structures like chimneys, silos and folded plates |   |   |   |   |   |   |   |   |   |   |   |
| CO5                                                                                                                         |         | Design prestressed precast concrete units.                  |   |   |   |   |   |   |   |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |         |                                                             |   |   |   |   |   |   |   |   |   |   |   |
| 1                                                                                                                           | COs/POs | a                                                           | b | c | d | e | f | g | h | i | j | k | l |
| 2                                                                                                                           | CO1     | H                                                           |   | M | M |   |   |   |   |   |   |   |   |
|                                                                                                                             | CO2     |                                                             |   | H | H |   |   |   |   |   |   |   |   |
|                                                                                                                             | CO3     |                                                             |   | H | H |   |   |   |   |   |   |   |   |
|                                                                                                                             | CO4     |                                                             |   | H | H |   |   |   |   |   |   |   |   |
|                                                                                                                             | CO5     |                                                             |   | H | H |   |   |   |   |   |   |   |   |

|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                              |
|---|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|----------------------------------------------|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|   |          |                                                                |                             |                    |                        | ✓                  |                         |                    |                                              |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                              |

## UNIT I GENERAL

8

Specific equipments for industries like Engineering. **Textile, Chemical etc.**, - Site layout and external facilities classification of industries minimum standards internal calculation – **Materials – Works.**

## UNIT II FUNCTIONAL REQUIREMENTS

10

1. Lighting – Natural and artificial – protection from the sun – sky light.
2. Services, Layout, wiring fixtures, cable and pipe bridges – Electrical installations – lighting - Substations - effluent.
3. Ventilation and fire protection, ventilation & air – conditioning, fire escapes and, chutes, fire alarms, extinguishers and hydrants.

## UNIT III PLANNING & DESIGN

9

(Requirement of factory and other rules)

Layout stages. Loading **Design of single bay and design of multi bay** multi storied frames in RCC and steel – **Analysis of industrial structures.**

## UNIT IV DESIGN OF APARTMENT STRUCTURES

10

**Cranes - Different types - principles** - design of girder – open web and solid web bunkers – **silos – R.C. ducts.**

## UNIT V CONSTRUCTION TECHNIQUES

8

**Expansion joints-** design of machine foundations and other foundations as per I.S. Code - Water proofing – roof drainage – joints – **sound, shock proof mountings.**

## TEXT BOOKS:

1. Purushothaman P ,”Reinforced Concrete Structural elements”, Tata McGraw-Hill, 1984.

## REFERENCES:

1. Pasala Dayaratnam,”Design of Steel Structure”, Wheeler publishers Allahabad , 1990.
2. Planning industrial structures Dunham, Industrial Structures McGraw-Hill Book Co; 1st edition (1948)
3. Henn W. Buildings for Industry, vols.I and II, London Hill Books, 1995.
4. Handbook on Functional Requirements of Industrial buildings, SP32 – 1986, Bureau of Indian Standards, New Delhi 1990.
5. Course Notes on Modern Developments in the Design and Construction of Industrial Structures, Structural Engineering Research Centre, Madras, 1982.

|                                                                                                                                                        |                                                                                    |                                                                |   |                             |   |               |                        |                    |   |                         |   |                    |   |                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------|---|-----------------------------|---|---------------|------------------------|--------------------|---|-------------------------|---|--------------------|---|-----------------------------------------|
| BCE053                                                                                                                                                 | ADVANCED CONSTRUCTION TECHNIQUES                                                   |                                                                |   |                             |   |               |                        |                    |   |                         | L | T                  | P | C                                       |
|                                                                                                                                                        | Total Contact Hours -45                                                            |                                                                |   |                             |   |               |                        |                    |   |                         | 3 | 0                  | 0 | 3                                       |
|                                                                                                                                                        | Prerequisite – Building Construction                                               |                                                                |   |                             |   |               |                        |                    |   |                         |   |                    |   |                                         |
|                                                                                                                                                        | Course Designed by – Dept of Civil Engineering                                     |                                                                |   |                             |   |               |                        |                    |   |                         |   |                    |   |                                         |
| OBJECTIVES:<br>To bring about a complete understanding of advanced construction techniques in sub structure<br>super structure and repair construction |                                                                                    |                                                                |   |                             |   |               |                        |                    |   |                         |   |                    |   |                                         |
| COURSE OUTCOMES (COs)                                                                                                                                  |                                                                                    |                                                                |   |                             |   |               |                        |                    |   |                         |   |                    |   |                                         |
| CO1                                                                                                                                                    | Understand the various processes involved in sub-structure construction            |                                                                |   |                             |   |               |                        |                    |   |                         |   |                    |   |                                         |
| CO2                                                                                                                                                    | Understand the various processes involved in super-structure construction.         |                                                                |   |                             |   |               |                        |                    |   |                         |   |                    |   |                                         |
| CO3                                                                                                                                                    | Understand the construction process of special structures and offshore structures. |                                                                |   |                             |   |               |                        |                    |   |                         |   |                    |   |                                         |
| CO4                                                                                                                                                    | Know about the rehabilitation techniques carried out for a structure.              |                                                                |   |                             |   |               |                        |                    |   |                         |   |                    |   |                                         |
| CO5                                                                                                                                                    | Know about the demolition techniques carried out for a structure.                  |                                                                |   |                             |   |               |                        |                    |   |                         |   |                    |   |                                         |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                            |                                                                                    |                                                                |   |                             |   |               |                        |                    |   |                         |   |                    |   |                                         |
| 1                                                                                                                                                      | COs/POs                                                                            | a                                                              | b | c                           | d | e             | f                      | g                  | h | i                       | j | k                  | l |                                         |
| 2                                                                                                                                                      | CO1                                                                                | M                                                              |   | M                           |   | H             |                        |                    |   |                         |   |                    |   |                                         |
|                                                                                                                                                        | CO2                                                                                | M                                                              |   | M                           |   | H             | L                      |                    |   |                         | L |                    |   |                                         |
|                                                                                                                                                        | CO3                                                                                | M                                                              |   | M                           |   | H             |                        |                    |   |                         |   |                    |   |                                         |
|                                                                                                                                                        | CO4                                                                                | M                                                              |   | M                           |   | H             |                        |                    |   |                         |   |                    |   |                                         |
|                                                                                                                                                        | CO5                                                                                | M                                                              |   | M                           |   | H             |                        |                    |   |                         |   |                    |   |                                         |
| 3                                                                                                                                                      | Category                                                                           | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) |   | Project/Term Paper/ Seminar/ Internship |
|                                                                                                                                                        |                                                                                    |                                                                |   |                             |   |               |                        | √                  |   |                         |   |                    |   |                                         |
| 4                                                                                                                                                      | Approval                                                                           | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |               |                        |                    |   |                         |   |                    |   |                                         |

## UNIT I SUB STRUCTURE CONSTRUCTION

15

Box jacking - pipe jacking - Under water construction of diaphragm walls and basement - Tunneling techniques - piling techniques - driving well and caisson - sinking cofferdam - cable anchoring and grouting - driving diaphragm walls, sheet piles - laying operations for built up offshore system - shoring for deep cutting - large reservoir construction - well points - dewatering and stand by plant equipment for underground open excavation.

## UNIT II SUPER STRUCTURE CONSTRUCTION FOR BUILDINGS

10

Vacuum dewatering of concrete flooring – concrete paving technology – techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections – launching techniques – suspended form work – erection techniques of tall structures, large span structures – launching techniques for heavy decks – insitu prestressing in high rise structures, aerial transporting handling erecting lightweight components on tall structures.

**UNIT III CONSTRUCTION OF SPECIAL STRUCTURES****10**

Erection of lattice towers and rigging of transmission line structures – construction sequence in cooling towers, silos, chimney, sky scrapers, bow string bridges, cable stayed bridges – launching and pushing of box decks – Advanced construction techniques for offshore structures – construction sequence and methods in domes and prestress domes – support structure for heavy equipment and conveyor and machinery in heavy industries – erection of articulated structures, braced domes and space decks.

**UNIT IV REHABILITATION TECHNIQUES****6**

Mud jacking grout through slab foundation - micropiling for strengthening floor and shallow profile - pipeline laying - protecting sheet piles, screw anchors - sub grade water proofing, underpinning, crack stabilization techniques.

**UNIT V DEMOLITION****4**

Advanced techniques and sequence in demolition and dismantling.

**REFERENCES:**

1. Robertwade Brown, Practical foundation engineering hand book, McGraw Hill Publications, 1995.
2. Patrick Powers. J., Construction Dewatering: New Methods and Applications, John Wiley & Sons, 1992.
3. Jerry Irvine, Advanced Construction Techniques, CA Rocketr, 1984
4. Peter.H.Emmons, “Concrete repair and maintenance illustrated”, Galgotia Publications Pvt. Ltd., 2001.
5. Sankar, S.K. and Saraswati, S., Construction Technology, Oxford University Press, New Delhi, 2008.

BCE054
 CONSTRUCTION PLANNING,SCHEDULING  
ANDCONTROL
 L
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 P
 C

Total Contact Hours - 45
 3
 0
 0
 3

Prerequisite – Construction Technology

Course Designed by – Dept of Civil Engineering

**OBJECTIVES:**  
 To study the finer aspects of planning, scheduling and controlling of construction projects.

**COURSE OUTCOMES (COs)**

|                                                                                                                             |                                                                                                                 |   |   |   |   |   |   |   |   |   |   |   |   |  |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|--|
| CO1                                                                                                                         | Know the elements of construction planning and estimating activity durations and resource requirements.         |   |   |   |   |   |   |   |   |   |   |   |   |  |
| CO2                                                                                                                         | Know the elements of scheduling and to apply appropriate tools and techniques like networks and coding systems. |   |   |   |   |   |   |   |   |   |   |   |   |  |
| CO3                                                                                                                         | Understand the monitoring and accounting of projects through cost control.                                      |   |   |   |   |   |   |   |   |   |   |   |   |  |
| CO4                                                                                                                         | Know the elements of quality control and safety of construction projects.                                       |   |   |   |   |   |   |   |   |   |   |   |   |  |
| CO5                                                                                                                         | Know the concept of gathering and using project information                                                     |   |   |   |   |   |   |   |   |   |   |   |   |  |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                                 |   |   |   |   |   |   |   |   |   |   |   |   |  |
| 1                                                                                                                           | COs/POs                                                                                                         | a | b | c | d | e | f | g | h | i | j | k | l |  |

|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                              |  |  |  |  |
|---|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|----------------------------------------------|--|--|--|--|
| 2 | CO1      | M                                                              |                             |                    | M                      |                    |                         | M                  | H                                            |  |  |  |  |
|   | CO2      | M                                                              |                             |                    | M                      |                    |                         | M                  | H                                            |  |  |  |  |
|   | CO3      | M                                                              |                             |                    | M                      |                    |                         | M                  | H                                            |  |  |  |  |
|   | CO4      | M                                                              |                             |                    | M                      |                    |                         | M                  | H                                            |  |  |  |  |
|   | CO5      | M                                                              |                             |                    | M                      |                    |                         | M                  | H                                            |  |  |  |  |
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |  |  |  |  |
|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                              |  |  |  |  |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                              |  |  |  |  |

## UNIT I CONSTRUCTION PLANNING

9

Basic Concepts in the Development of Construction Plans - Choice of Technology and Construction Method - Defining Work Tasks - **Defining Precedence Relationships among Activities - Estimating Activity Durations** - Estimating Resource Requirements for Work Activities - Coding Systems

## UNIT II SCHEDULING PROCEDURES AND TECHNIQUES

9

Construction Schedules - Critical Path Method – Scheduling Calculations - Float - Presenting Project Schedules - Scheduling for Activity-on-Node and with Leads, Lags, and Windows - Scheduling with Resource Constraints and Precedences - **Use of Advanced Scheduling Techniques - Scheduling with Uncertain Durations** - Calculations for Monte Carlo Schedule Simulation - Crashing and Time/Cost Tradeoffs - Improving the Scheduling Process.

## UNIT III COST CONTROL, MONITORING AND ACCOUNTING

9

The Cost Control Problem - The Project Budget - **Forecasting for Activity Cost Control - Financial Accounting Systems and Cost Accounts** - Control of Project Cash Flows - Schedule Control - Schedule and Budget Updates - **Relating Cost and Schedule Information.**

## UNIT IV QUALITY CONTROL DURING CONSTRUCTION

9

Quality Concerns in Construction - **Organizing for Quality** - Work and Material specifications - Total Quality Control - Quality Control by Statistical Methods - Statistical Quality Control with Sampling by Attributes - **Statistical Quality Control with Sampling by Variables**

## UNIT V ORGANIZATION AND USE OF PROJECT INFORMATION

9

Types of Project Information - **Accuracy and Use of Information - Computerized Organization and Use of Information - Organizing Information in Databases** - Relational Model of Databases - Other Conceptual Models of Databases - **Centralized Database Management Systems - Databases and Applications Programs - Information Transfer and Flow.**

## REFERENCES:

1. Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, Tata McGraw-Hill Publishing Company, New Delhi, 1998.
2. Calin M. Popescu, Chotchai Charoenngam, Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications, Wiley, New York, 1995.

- Chris Hendrickson and Tung Au, Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.
- Willis, E. M., Scheduling Construction Projects, John Wiley & Sons, 1986.
- Halpin, D. W., Financial and Cost Concepts for Construction Management, John Wiley & Sons, New York, 1985.

|                                                                                                                                                                                                                                                            |                                                                                                    |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|----------------------------------------------|--|
| BCE055                                                                                                                                                                                                                                                     | INDUSTRIAL WASTE TREATMENT AND DISPOSAL                                                            |                                                                |                             |   |                    |   |                        | L | T                  | P | C                       |   |                    |  |                                              |  |
|                                                                                                                                                                                                                                                            | Total Contact Hours - 45                                                                           |                                                                |                             |   |                    |   |                        | 3 | 0                  | 0 | 3                       |   |                    |  |                                              |  |
|                                                                                                                                                                                                                                                            | Prerequisite – Environmental Engineering                                                           |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                                                                                                                                                            | Course Designed by – Dept of Civil Engineering                                                     |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| OBJECTIVES:<br>To provide knowledge on sources and characteristics of industrial wastewater, techniques and approaches for minimizing the generation and application of physio-chemical and biological treatment methods for recovery, reuse and disposal. |                                                                                                    |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| COURSE OUTCOMES (COs)                                                                                                                                                                                                                                      |                                                                                                    |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO1                                                                                                                                                                                                                                                        | Have a fundamental knowledge of the effluent discharge standards and waste minimization technology |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO2                                                                                                                                                                                                                                                        | Have a well-founded knowledge of characteristics of industrial wastewater and treatment methods.   |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO3                                                                                                                                                                                                                                                        | Acquire knowledge about conventional methods of treatment for industrial waste.                    |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO4                                                                                                                                                                                                                                                        | Understand various biological treatment methods                                                    |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO5                                                                                                                                                                                                                                                        | Have a fundamental knowledge of combined treatment of industrial and municipal wastes.             |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                                                                                                                |                                                                                                    |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| 1                                                                                                                                                                                                                                                          | COs/POs                                                                                            | a                                                              | b                           | c | d                  | e | f                      | g | h                  | i | j                       | k | l                  |  |                                              |  |
| 2                                                                                                                                                                                                                                                          | CO1                                                                                                |                                                                |                             |   |                    |   |                        | H | M                  |   |                         | H | M                  |  |                                              |  |
|                                                                                                                                                                                                                                                            | CO2                                                                                                |                                                                |                             | L |                    |   |                        | M |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                                                                                                                                                            | CO3                                                                                                | L                                                              | M                           | M |                    |   |                        | M |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                                                                                                                                                            | CO4                                                                                                | L                                                              | M                           | M |                    |   |                        | M |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                                                                                                                                                            | CO5                                                                                                | L                                                              | M                           | M |                    |   |                        | H |                    | H |                         |   |                    |  |                                              |  |
| 3                                                                                                                                                                                                                                                          | Category                                                                                           | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) |   | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) |  | Project/Term Paper/ Seminar/ Internship (PR) |  |
|                                                                                                                                                                                                                                                            |                                                                                                    |                                                                |                             |   |                    |   |                        |   | √                  |   |                         |   |                    |  |                                              |  |
| 4                                                                                                                                                                                                                                                          | Approval                                                                                           | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |

## UNIT I EFFECTS AND CONTROL OF INDUSTRIAL POLLUTION 9

Effects of industrial wastes on streams, land and air, wastewater treatment plants, water quality criteria – effluent standards : Process modification, method and material changes, housekeeping etc., to reduce water discharges and strength of the waste and established recovery methods for by products within the plant operations.

## UNIT II      CHARACTERISTICS AND      TREATMENT      OF INDUSTRIAL WASTEWATER

9

Characteristics of major industrial waste water (liquid wastes) Chemical Industries: Petrochemicals & refineries, pharmaceuticals. Apparel Industries: Textile, synthetic fibres, leather, paper. Agro Industries: Fertilizer Food Industries: Heat – packing pickles, canning poultry and eggs, distillers, sugar. Metallurgical Industries: Thermal power station, nuclear power plants.

## UNIT III      PHYSICAL TREATMENT METHODS      9

Conventional methods of treatment and disposal of industrial wastes. Equalisation and neutralization, separation of solids – sedimentation and filtrations.

## UNIT IV      BIOLOGICAL TREATMENT METHODS      9

Removal of organic contents: Biological treatment methods, aerobic and anaerobic, digestion, trickling filters, stabilization ponds, activated sludge process – oxidation ditch.

## UNIT V      PHYSICO - CHEMICAL TREATMENT METHODS      9

Physico - Chemical Treatment Method – Neutralization, coagulation, flocculation, adsorption and precipitation. Combined treatment of industrial and municipal wastes.

### TEXT BOOKS:

1. Eckenfelder W.W, "Industrial Water Pollution Control", McGraw Hill, New York, 1989

### REFERENCES:

1. Arceivala S.J & Shyam Asolekar R, "Waste Water Treatment and Pollution Control Tata McGraw Hill, 1998.
2. [Nelson Leonard Nemerow](#), "Theories and practice of industrial waste treatment", Addison Wesley Pub. Co., 1963
3. World Bank Group "Pollution prevention and Treatment Hand Book" World Bank and UNEP Washington DC, 1998

|                                                                                                                                                                                      |                                                                                                                                            |  |   |   |   |   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|--|---|---|---|---|
| BCE056                                                                                                                                                                               | SOLID AND HAZARDOUS WASTE MANAGEMENT                                                                                                       |  | L | T | P | C |
|                                                                                                                                                                                      | Total Contact Hours - 45                                                                                                                   |  | 3 | 0 | 0 | 3 |
|                                                                                                                                                                                      | Prerequisite – Environmental Engineering                                                                                                   |  |   |   |   |   |
|                                                                                                                                                                                      | Course Designed by – Dept of Civil Engineering                                                                                             |  |   |   |   |   |
| <b>OBJECTIVES:</b><br>To educate the students on the principles involved in the management of municipal solid waste and hazardous wastes- from source identification up to disposal. |                                                                                                                                            |  |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                         |                                                                                                                                            |  |   |   |   |   |
| CO1                                                                                                                                                                                  | To make them understand the fundamentals of solid and hazardous wastes and also the types, need and sources of solid and hazardous wastes. |  |   |   |   |   |
| CO2                                                                                                                                                                                  | To understand about the methods of waste characterization and source reduction and to study the various methods of generation of wastes.   |  |   |   |   |   |

|                                                                                                                             |                                                                                                                                                                 |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|----------------------------------------------|--|
| CO3                                                                                                                         | To understand in detail about the storage, collection and transport of wastes. and also to study about the methods used for handling and segregation of wastes. |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO4                                                                                                                         | To improve the knowledge on the waste processing techniques which includes incineration, solidification and stabilization of hazardous wastes                   |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| CO5                                                                                                                         | To know about the basics of the waste disposal options and also a detailed study on the disposal in landfills and also to learn about landfill remediation      |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                                                                                 |                                                                |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |
| 1                                                                                                                           | COs/POs                                                                                                                                                         | a                                                              | b | c                           | d | e                  | f | g                      | h | i                  | j | k                       | l |                    |  |                                              |  |
| 2                                                                                                                           | CO1                                                                                                                                                             | H                                                              |   |                             |   | H                  |   |                        |   | M                  |   |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO2                                                                                                                                                             | H                                                              |   |                             | M |                    |   |                        |   | H                  |   |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO3                                                                                                                                                             |                                                                |   | M                           |   |                    | H |                        |   |                    |   |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO4                                                                                                                                                             | H                                                              |   |                             |   |                    |   | H                      |   | L                  |   |                         |   |                    |  |                                              |  |
|                                                                                                                             | CO5                                                                                                                                                             |                                                                | M |                             |   | H                  |   |                        |   | H                  |   |                         |   |                    |  |                                              |  |
| 3                                                                                                                           | Category                                                                                                                                                        | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) |   | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) |  | Project/Term Paper/ Seminar/ Internship (PR) |  |
|                                                                                                                             |                                                                                                                                                                 |                                                                |   |                             |   |                    |   |                        |   | √                  |   |                         |   |                    |  |                                              |  |
| 4                                                                                                                           | Approval                                                                                                                                                        | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                              |  |

## UNIT I INTRODUCTION

9

Types and Sources of solid and hazardous wastes-Need for solid and hazardous waste management- Elements of integrated waste management and roles of stakeholders- Salient features of Indian legislations on management and handling of municipal solid wastes, hazardous wastes, biomedical wastes, lead acid batteries, plastics and fly ash,financing waste management.

## UNIT II WASTE CHARACTERIZATION AND SOURCE REDUCTION 9

Waste generation rates and variation-Composition, physical, chemical and biological properties of solid wastes- Hazardous Characteristics- TCLP tests- waste sampling and characterization plan- source reduction of wastes- Recycling and reuse- waste exchange.

## UNIT III STORAGE, COLLECTION AND TRANSPORT OF WASTES 9

Handling and segregation of wastes at source- storage and collection of municipal solid wastes- Analysis of collection systems- Need for transfer and transport- Transfer stations Optimizing Waste allocation- compatibility, storage, labeling and handling of hazardous wastes- hazardous waste manifests and transport.

## UNIT IV WASTE PROCESSING TECHNIQUES 9

Objectives of waste processing- material separation and processing technologies- biological and chemical conversion technologies-method and controls of composting- thermal conversion technologies and energy recovery- incineration- solidification and stabilization of hazardous wastes- treatment of biomedical wastes.

## UNIT V WASTE DISPOSAL 9

Waste disposal options- Disposal in landfills- Landfill Classification, types and methods- site selection- design and operation of sanitary landfills, secure landfills and landfill bioreactors-

leachate and landfill gas management- landfill closure and environmental monitoring- closure of landfills- landfill remediation.

#### REFERENCES:

- 1.George Tchobanoglous, Hilary Theisen and Samuel A, Vigil “Integrated Solid Waste Management, McGraw- Hill International edition, New York, 1993.
- 2.CPHEEO “Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organisation, Government of India, New Delhi, 2000.
- 3.Micheael D. Lagrega, Philip L Buckingham, Jeffrey C. E vans and Environmental Resources Management, Hazardous waste Management, McGraw- Hill International edition, New york, 2001.
- 4.Vesilind P.A., Worrell W and Reinhart, Solid Waste Engineering, Thomson Learning Inc., Singapore, 2002.

#### CORE ELECTIVE – II

|                                                                                                                                                                             |                                                                                           |                                                                |                             |               |                        |                    |                         |                    |                                            |   |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|---------------|------------------------|--------------------|-------------------------|--------------------|--------------------------------------------|---|---|---|---|
| BCE057                                                                                                                                                                      |                                                                                           | DESIGN OF R.C.FRAME STRUCTURES                                 |                             |               |                        |                    |                         |                    | L                                          | T | P | C |   |
|                                                                                                                                                                             |                                                                                           | Total Contact Hours - 45                                       |                             |               |                        |                    |                         |                    | 3                                          | 0 | 0 | 3 |   |
|                                                                                                                                                                             |                                                                                           | Prerequisite – Reinforced Concrete Structures – I              |                             |               |                        |                    |                         |                    |                                            |   |   |   |   |
|                                                                                                                                                                             |                                                                                           | Course Designed by – Dept of Civil Engineering                 |                             |               |                        |                    |                         |                    |                                            |   |   |   |   |
| OBJECTIVES:                                                                                                                                                                 |                                                                                           |                                                                |                             |               |                        |                    |                         |                    |                                            |   |   |   |   |
| The design aspects and analysis methodologies of tall buildings will be introduced. The stability analysis of tall buildings is another important objective of this course. |                                                                                           |                                                                |                             |               |                        |                    |                         |                    |                                            |   |   |   |   |
| COURSE OUTCOMES (COs)                                                                                                                                                       |                                                                                           |                                                                |                             |               |                        |                    |                         |                    |                                            |   |   |   |   |
| CO1                                                                                                                                                                         | Computation of design moments and shears.                                                 |                                                                |                             |               |                        |                    |                         |                    |                                            |   |   |   |   |
| CO2                                                                                                                                                                         | Analysis for wind and earthquake effects , Design of beams, columns and slabs.            |                                                                |                             |               |                        |                    |                         |                    |                                            |   |   |   |   |
| CO3                                                                                                                                                                         | Design by empirical and rigid frame analysis.                                             |                                                                |                             |               |                        |                    |                         |                    |                                            |   |   |   |   |
| CO4                                                                                                                                                                         | Design of various types of shear walls and detailing                                      |                                                                |                             |               |                        |                    |                         |                    |                                            |   |   |   |   |
| CO5                                                                                                                                                                         | Moment distribution and FEM methods of analysis of tall building using standard packages. |                                                                |                             |               |                        |                    |                         |                    |                                            |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                                 |                                                                                           |                                                                |                             |               |                        |                    |                         |                    |                                            |   |   |   |   |
| 1                                                                                                                                                                           | COs/POs                                                                                   | a                                                              | b                           | c             | d                      | e                  | f                       | g                  | h                                          | i | j | k | l |
| 2                                                                                                                                                                           | CO1                                                                                       |                                                                |                             | H             | H                      | H                  |                         |                    |                                            |   |   |   |   |
|                                                                                                                                                                             | CO2                                                                                       |                                                                |                             | H             | H                      |                    |                         |                    |                                            |   |   |   |   |
|                                                                                                                                                                             | CO3                                                                                       |                                                                |                             | H             | H                      |                    |                         |                    |                                            |   |   |   |   |
|                                                                                                                                                                             | CO4                                                                                       |                                                                |                             | H             | H                      |                    |                         |                    |                                            |   |   |   |   |
|                                                                                                                                                                             | CO5                                                                                       | M                                                              |                             | H             | H                      |                    |                         |                    |                                            |   |   |   |   |
| 3                                                                                                                                                                           | Category                                                                                  | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/Seminar/Internship (PR) |   |   |   |   |
|                                                                                                                                                                             |                                                                                           |                                                                |                             |               |                        |                    |                         |                    |                                            |   |   |   |   |
| 4                                                                                                                                                                           | Approval                                                                                  | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |               |                        |                    |                         |                    |                                            |   |   |   |   |

**UNIT I INDUSTRIAL FRAMES****8**

Single Storey Industrial Frames: Estimation of member forces in single storey R.C.C. Industrial bents -of flat Top & gabled configuration from handbooks – Design of members, rigid joints and footing detailing.

**UNIT II RC STRUCTURES ELEMENTS****10**

Medium – Rise Framed Buildings : Computation of design moments and shears using substitute frame methods of IS 456 and explanatory handbooks – Analysis for wind and earthquake effects – Design of beams, columns and slabs by Sp-16 Design aid – Detailing of reinforcement – Design of staircases and footings.

**UNIT III DESIGN OF FLAT SLAB****9**

Flat Slab Design, Design of heavily loaded warehouse type – Multi storey frames using flat – slab type of construction – Design by empirical and rigid frame analysis – Detailing – Design of pile foundations.

**UNIT IV FUNCTIONAL DETAILS OF TALL BUILDINGS****9**

Tall building - functional details – wells, stairs and shear walls – lateral deflection - Frame and shear wall interaction - Design of various types of shear walls and detailing – Design of pile foundations.

**UNIT V COMPUTER APPLICATION****9**

Computer Methods. Moment distribution and FEM methods of analysis of tall building using standard packages.

**TEXT BOOKS:**

1. Vazirani V.N & Ratwani MM, "Concrete Structures", Khanna Publishers, New Delhi, 1995

**REFERENCES:**

1. P.Purushothaman, Reinforced Concrete Structural elements Tata McGraw Hill Co, New Delhi.
2. R.Park&T.Paulay, Design of Reinforced Concrete Structural Elements – John Wiley & Sons, New York, 1975.
3. C.M.Reynolds& J.C. Steedam Reinforced Concrete Designers Handbook Rupa& Co, Calcutta, 1987.
4. V.Baikov, and E.Singalov, Reinforced Concrete Structures, Mir Publishers, Moscow, 1971.
5. W.H.MosleyandW.J.Spencer, Micro Computer Application in Structural Engineering McMilfan Press, London, 1986.

|                                                                                                                                                                                                     |                                                |          |          |          |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|----------|----------|----------|----------|
| <b>BCE058</b>                                                                                                                                                                                       | <b>TALL STRUCTURES</b>                         | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                                                                                                                     | Total Contact Hours - 45                       | 3        | 0        | 0        | 3        |
|                                                                                                                                                                                                     | Prerequisite – Structural Analysis – I         |          |          |          |          |
|                                                                                                                                                                                                     | Course Designed by – Dept of Civil Engineering |          |          |          |          |
| <b>OBJECTIVES:</b><br>The design aspects and analysis methodologies of tall structures will be introduced. The stability analysis of tall structures is another important objective of this course. |                                                |          |          |          |          |

| COURSE OUTCOMES (COs)                                                                                                       |          |                                                                                |   |                             |   |                    |                        |   |                    |   |                         |                    |                                              |
|-----------------------------------------------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|---|--------------------|---|-------------------------|--------------------|----------------------------------------------|
| CO1                                                                                                                         |          | Implement design philosophies for the development of high rise structures      |   |                             |   |                    |                        |   |                    |   |                         |                    |                                              |
| CO2                                                                                                                         |          | Find out the design loads for high rise buildings                              |   |                             |   |                    |                        |   |                    |   |                         |                    |                                              |
| CO3                                                                                                                         |          | Analyze the behavior of tall buildings subjected to lateral loading.           |   |                             |   |                    |                        |   |                    |   |                         |                    |                                              |
| CO4                                                                                                                         |          | Perform computerized general three dimensional analysis for high rise building |   |                             |   |                    |                        |   |                    |   |                         |                    |                                              |
| CO5                                                                                                                         |          | Perform stability analysis using various methods for tall buildings            |   |                             |   |                    |                        |   |                    |   |                         |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                                |   |                             |   |                    |                        |   |                    |   |                         |                    |                                              |
| 1                                                                                                                           | COs/POs  | a                                                                              | b | c                           | d | e                  | f                      | g | h                  | i | j                       | k                  | l                                            |
| 2                                                                                                                           | CO1      |                                                                                |   | H                           | H |                    |                        |   |                    |   |                         |                    |                                              |
|                                                                                                                             | CO2      |                                                                                |   | H                           | H |                    |                        |   |                    |   |                         |                    |                                              |
|                                                                                                                             | CO3      |                                                                                |   | H                           | H |                    |                        |   |                    |   |                         |                    |                                              |
|                                                                                                                             | CO4      | M                                                                              |   | H                           | H |                    |                        |   |                    |   |                         |                    |                                              |
|                                                                                                                             | CO5      |                                                                                |   | H                           | H |                    |                        |   |                    |   |                         |                    |                                              |
| 3                                                                                                                           | Category | Humanities & Social Studies (HS)                                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                             |          |                                                                                |   |                             |   |                    |                        |   | √                  |   |                         |                    |                                              |
| 4                                                                                                                           | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016                 |   |                             |   |                    |                        |   |                    |   |                         |                    |                                              |

## UNIT I GENERAL

9

Historical Development & Design Criteria: Design philosophy Loading, strength and stability. Stiffness and dirt limitations. Human comfort, Creep, shrinkage and temperature effects – Fire – Foundation -settlement – Soil structure interaction.

## UNIT II LOADS

9

Gravity loading Methods and lively hood reduction- Impact loading - Construction loads – Wind loading – Static and dynamic approach – Analytical and experimental method – Earthquake loading – Model analysis.

## UNIT III BEHAVIOUR SYSTEMS

9

Behaviour of Various Structural system: Factors affecting growth, height and structural form. High Rise behavior- Rigid frames - Braced frames - Infilled frames – Shear walls – Coupled shear walls – Walls frames – Tubular cores and hybrid mega systems.

## UNIT IV ANALYSIS & DESIGN

10

Analysis & Design: Modeling – Analysis of building as total structural system considering overall integrity and major sub – system interaction. Analysis of member forces- Drift and twist - Computerised general three dimensional analysis - Section shapes, Properties and resisting capacity – Design of differential movement – Creep and shrinkage effects- Temperature effects and fiber resistance.

## UNIT V STABILITY OF TALL BUILDINGS

8

**Stability of Tall Buildings : Overall buckling analysis** - Wall frames - Approximate methods – Second order effects – P – Delta – **Simultaneous first – order and P – Delta analysis** – Translational – Torsional instability – Out of plumb – **Effect of foundation rotation.**

#### TEXT BOOKS:

1. Wolfgang Schueller " High Rise Building Structures", John Wiley And Sons, NewYork, 1976.

#### REFERENCES:

1. [Tung-Yen Lin](#) & [Sidney D. Stotesbury](#), "Structures Concept and Systems for Architects and Engineers", John Wiley & Sons, 1981
2. Lynn Baedle S., "Advances in Tall Buildings", CBS Publishers and Distributors. New Delhi, 1986.
3. Bryan Stafford Smith And Alex Coull, " Tall Building Structures ", Analysis And Design, John Wiley And Sons, Inc., 1991.

|                                                                                                                                                |          |                                                                                                               |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
|------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------------------------------|-----------------------------|---|---------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|---|
| BCE059                                                                                                                                         |          | SAFETY PRACTICES IN CONSTRUCTION                                                                              |                             |   |               |                        |                    |   | L                       | T | P                  | C                                            |   |
|                                                                                                                                                |          | Total Contact Hours - 45                                                                                      |                             |   |               |                        |                    |   | 3                       | 0 | 0                  | 3                                            |   |
|                                                                                                                                                |          | Prerequisite – Building Construction                                                                          |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
|                                                                                                                                                |          | Course Designed by – Dept of Civil Engineering                                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| OBJECTIVES:                                                                                                                                    |          |                                                                                                               |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| To study various safety practices that has to be adopted in construction and to know the finer aspects of safety programs, sampling and audit. |          |                                                                                                               |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| COURSE OUTCOMES (COs)                                                                                                                          |          |                                                                                                               |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| CO1                                                                                                                                            |          | Know the safety concepts that have to be adopted in construction                                              |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| CO2                                                                                                                                            |          | Understand the elements of safety programmes                                                                  |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| CO3                                                                                                                                            |          | Know the awareness on safety practices that has to be ensured during construction.                            |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| CO4                                                                                                                                            |          | Know about the accident prevention, safety sampling and audit.                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| CO5                                                                                                                                            |          | Know the safety concepts in hand tools, grinding, lifting works and while operating fire fighting equipments. |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                    |          |                                                                                                               |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| 1                                                                                                                                              | COs/POs  | a                                                                                                             | b                           | c | d             | e                      | f                  | g | h                       | i | j                  | k                                            | l |
| 2                                                                                                                                              | CO1      | M                                                                                                             |                             |   |               |                        | H                  | M | H                       |   |                    |                                              |   |
|                                                                                                                                                | CO2      | M                                                                                                             |                             |   |               |                        | H                  | M | H                       |   |                    |                                              |   |
|                                                                                                                                                | CO3      | M                                                                                                             |                             |   |               |                        | H                  | M | H                       |   |                    |                                              |   |
|                                                                                                                                                | CO4      | M                                                                                                             |                             |   |               |                        | H                  | M | H                       |   |                    |                                              |   |
|                                                                                                                                                | CO5      | M                                                                                                             |                             |   |               |                        | H                  | M | H                       |   |                    |                                              |   |
| 3                                                                                                                                              | Category | Humanities & Social Studies (HS)                                                                              | Basic Sciences & Maths (BS) |   | Engg Sciences | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |
|                                                                                                                                                |          |                                                                                                               |                             |   |               |                        | √                  |   |                         |   |                    |                                              |   |
| 4                                                                                                                                              | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |

**UNIT I SAFETY CONCEPTS****9**

Construction accidents - Construction Safety Management: Importance - causes of accident, safety measures- Environmental issues in construction-Construction industry related laws. Human factors in safety – legal and financial aspects of accidents in construction – occupational and safety hazard assessment.

**UNIT II SAFETY PROGRAMMES****9**

Safety Programmes - Construction Safety - Elements of an Effective Safety Programmes - Job-site assessment - Safety Meetings - Safety Incentives. Contractual Obligations - Safety in construction contracts- Substance Abuse - safety Record Keeping.

**UNIT III SAFETY PRACTICES****9**

Safety Culture - Safe Workers- Safety and First Line Supervisors - Safety and Middle Managers - Top Management Practices, Company Activities and Safety - Safety Personnel - Sub-contractual Obligation - Project Coordination and Safety Procedures - Workers Compensation

**UNIT IV SAFETY SAMPLING AND AUDIT****9**

Accident prevention-cost of accidents-Safety and productivity-safety provision in the factories act-accident reporting investigation and statistics-total loss control and damage control-Safety sampling- safety audit - critical incident technique- safety equipment - planning and site preparation- safety system of storing construction materials-Excavation - blasting- timbering-scaffolding- safe use of ladders- safety in welding.

**UNIT V SAFETY IN LIFTING AND FIRE****9**

Safety in hand tools- Safety in grinding- Hoisting apparatus and conveyors- Safety in the use of mobile cranes-Manual handling- Safety in demolition work- Trusses, girders and beams- First-aid- Fire hazards and preventing methods-Interesting experiences at the construction site against the fire accidents.

**REFERENCES**

1. Jimmy W. Hinze, Construction Safety, Prentice Hall Inc., 1997
2. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and Health Management, Prentice Hall Inc., 2001.
3. Hand Book on Construction Safety Practices, SP:70, BIS, 2001.

|                                                                                                                                                                                   |                                                                                |          |          |          |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|----------|----------|----------|----------|
| <b>BCE060</b>                                                                                                                                                                     | <b>MODERN CONSTRUCTION MATERIALS</b>                                           | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                                                                                                   | Total Contact Hours - 45                                                       | 3        | 0        | 0        | 3        |
|                                                                                                                                                                                   | Prerequisite – Building Construction                                           |          |          |          |          |
|                                                                                                                                                                                   | Course Designed by – Dept of Civil Engineering                                 |          |          |          |          |
| <b>OBJECTIVES:</b><br>To bring about an exposure to design concepts structures, the loads, systems, structural materials, design procedures, repair and rehabilitation of systems |                                                                                |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                      |                                                                                |          |          |          |          |
| CO1                                                                                                                                                                               | Identify the various types of concretes and their constituents and properties. |          |          |          |          |

|                                                                                                                             |                                                                                                     |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
| CO2                                                                                                                         | Identify the various types of metals, their properties and applications.                            |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO3                                                                                                                         | Identify the various composite materials, their properties and applications.                        |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO4                                                                                                                         | Understand the concept of water-proofing and identify the purpose of flooring and façade materials. |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO5                                                                                                                         | Design and develop smart intelligent buildings.                                                     |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                     |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| 1                                                                                                                           | COs/POs                                                                                             | a                                                              | b | c                           | d | e                  | f                      | g                  | h | i                       | j | k                  | l                                            |
| 2                                                                                                                           | CO1                                                                                                 | M                                                              |   |                             |   | H                  |                        | M                  |   |                         | L |                    |                                              |
|                                                                                                                             | CO2                                                                                                 | M                                                              |   |                             |   | H                  |                        | M                  |   |                         |   |                    |                                              |
|                                                                                                                             | CO3                                                                                                 | M                                                              |   |                             |   | H                  |                        | M                  |   | L                       |   |                    |                                              |
|                                                                                                                             | CO4                                                                                                 | M                                                              |   |                             |   | H                  |                        | M                  |   |                         |   |                    |                                              |
|                                                                                                                             | CO5                                                                                                 | M                                                              |   |                             |   | H                  |                        | M                  |   |                         |   |                    |                                              |
| 3                                                                                                                           | Category                                                                                            | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                             |                                                                                                     |                                                                |   |                             |   |                    |                        |                    | √ |                         |   |                    |                                              |
| 4                                                                                                                           | Approval                                                                                            | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |

### UNIT I SPECIAL CONCRETES

10

Concretes, Behaviour of concretes - High Strength and High Performance Concrete – Fibre Reinforced Concrete, Self compacting concrete, Alternate Materials to concrete.

### UNIT II METALS

10

Steels - New Alloy Steels – Aluminum and its Products –Coatings to reinforcement – Applications.

### UNIT III COMPOSITES

10

Plastics –Reinforced Polymers – FRP – Applications

### UNIT IV OTHER MATERIALS

10

Water Proofing Compounds – Non-weathering Materials – Flooring and Façade Materials

### UNIT V SMART AND INTELLIGENT MATERIALS

5

Smart and Intelligent Materials for intelligent buildings - Special features

### REFERENCES:

1. Santhakumar A.R., Concrete Technology, Oxford University Press, New Delhi. 2007.
2. Mamlouk, M.S. and Zaniewski, J.P., Materials for Civil and Construction Engineers, Prentice Hall Inc., 1999.
3. Ashby, M.F. and Jones.D.R.H.H. “Engineering Materials 1: An Introduction to Properties, applications and designs”, Elsevier Publications, 2005.

4. Shan Somayaji, Civil Engineering Materials, Prentice Hall Inc., 2001
5. Aitkens , High Performance Concrete, McGraw Hill, 1999
6. Deucher, K.N, Korfiatis, G.P and Ezeldin, A.S, Materials for Civil and Highway Engineers, Prentice Hall Inc., 1998.
7. Shetty M.S, Concrete Technology: Theory and Practice, S.Chand & Company Ltd., 2005.
8. ACI Report 440.2R-02, “Guide for the Design and Construction of Externally Bonded Rp Systems For Strengthening Concrete Structures”, American Concrete Institute, 2002.

|                                                                                                                                                                                                                                                          |                                                                                |                                                                |                             |   |                    |                        |                    |   |                         |                    |                                         |   |   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|--------------------|-----------------------------------------|---|---|
| BCE061                                                                                                                                                                                                                                                   | AIR & NOISE POLLUTION                                                          |                                                                |                             |   |                    |                        |                    |   | L                       | T                  | P                                       | C |   |
|                                                                                                                                                                                                                                                          | Total Contact Hours - 45                                                       |                                                                |                             |   |                    |                        |                    |   | 3                       | 0                  | 0                                       | 3 |   |
|                                                                                                                                                                                                                                                          | Prerequisite – Environmental Studies                                           |                                                                |                             |   |                    |                        |                    |   |                         |                    |                                         |   |   |
|                                                                                                                                                                                                                                                          | Course Designed by – Dept of Civil Engineering                                 |                                                                |                             |   |                    |                        |                    |   |                         |                    |                                         |   |   |
| OBJECTIVES:                                                                                                                                                                                                                                              |                                                                                |                                                                |                             |   |                    |                        |                    |   |                         |                    |                                         |   |   |
| 1. This subject covers the sources, characteristics and effects of air and noise pollution and the methods of controlling the same. The student is expected to know about source inventory and control mechanism.                                        |                                                                                |                                                                |                             |   |                    |                        |                    |   |                         |                    |                                         |   |   |
| 2. The emphasis in this course will be the monitoring and control of particulate and Gaseous pollutants, Minimization of the noise and noise pollution including technical measures, Codes, regulations, directives and standards about noise pollution. |                                                                                |                                                                |                             |   |                    |                        |                    |   |                         |                    |                                         |   |   |
| COURSE OUTCOMES (COs)                                                                                                                                                                                                                                    |                                                                                |                                                                |                             |   |                    |                        |                    |   |                         |                    |                                         |   |   |
| CO1                                                                                                                                                                                                                                                      | To learn about the air pollutants, sources and its effects.                    |                                                                |                             |   |                    |                        |                    |   |                         |                    |                                         |   |   |
| CO2                                                                                                                                                                                                                                                      | To have a clear understanding on the air quality standards and its techniques. |                                                                |                             |   |                    |                        |                    |   |                         |                    |                                         |   |   |
| CO3                                                                                                                                                                                                                                                      | To determine the fluid resistance for organic materials.                       |                                                                |                             |   |                    |                        |                    |   |                         |                    |                                         |   |   |
| CO4                                                                                                                                                                                                                                                      | To find the Properties of air pollution and its control measures.              |                                                                |                             |   |                    |                        |                    |   |                         |                    |                                         |   |   |
| CO5                                                                                                                                                                                                                                                      | To learn about the effects and the sources of noise pollution.                 |                                                                |                             |   |                    |                        |                    |   |                         |                    |                                         |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                                                                                                              |                                                                                |                                                                |                             |   |                    |                        |                    |   |                         |                    |                                         |   |   |
| 1                                                                                                                                                                                                                                                        | COs/POs                                                                        | a                                                              | b                           | c | d                  | e                      | f                  | g | h                       | i                  | j                                       | k | l |
| 2                                                                                                                                                                                                                                                        | CO1                                                                            | H                                                              | L                           |   |                    |                        | M                  | H |                         |                    |                                         |   |   |
|                                                                                                                                                                                                                                                          | CO2                                                                            |                                                                |                             | H |                    |                        |                    |   |                         | L                  |                                         |   | M |
|                                                                                                                                                                                                                                                          | CO3                                                                            |                                                                | M                           |   | H                  |                        |                    | H |                         | H                  |                                         |   |   |
|                                                                                                                                                                                                                                                          | CO4                                                                            | H                                                              |                             |   |                    |                        |                    |   | M                       | M                  |                                         |   |   |
|                                                                                                                                                                                                                                                          | CO5                                                                            |                                                                |                             |   | H                  |                        |                    |   |                         | H                  |                                         |   |   |
| 3                                                                                                                                                                                                                                                        | Category                                                                       | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship |   |   |
|                                                                                                                                                                                                                                                          |                                                                                |                                                                |                             |   |                    |                        | √                  |   |                         |                    |                                         |   |   |
| 4                                                                                                                                                                                                                                                        | Approval                                                                       | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |   |                    |                        |                    |   |                         |                    |                                         |   |   |

## UNIT I INTRODUCTION

9

Definition of clean air, nature, air pollutants, sources of air pollutants, effects of air pollution on man, animal, vegetation and properties.

## **UNIT II AMBIENT AIR QUALITY STANDARDS AND AIR QUALITY MONITORING 10**

Harmful concentration – geographical factors in air pollution – air pollution control legislation. Classification sampling; sampling techniques; monitoring atmospheric pollution.

## **UNIT III FLUID RESISTANCE TO PARTICLE MOTION 9**

Principles of removal of a gaseous constituent; adsorption and combustion; catalytic combustion of organic materials; catalytic oxidation and decomposition.

## **UNIT IV AIR POLLUTION AND CONTROL MEASURES 9**

Setting chambers; momentum separators, fibrous filters; electro static precipitators; bag houses centrifugal spray scrubbers; venture scrubbers; elementary principles of air pollution e-control techniques.

## **UNIT V NOISE POLLUTION 8**

Sound and noise; sources of noise pollution, environmental and industrial noise; effects of noise pollution: measures for prevention and control of noise; environmental and industrial noise; noise control legislation.

### **TEXT BOOKS:**

1. Anjaneyulu D., “Air Pollution and Control Technologies”, Allied Publishers, Mumbai, 2002.

### **REFERENCES:**

1. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.
2. Rao M.N., and Rao H. V. N., Air Pollution Control, Tata-McGraw-Hill, New Delhi, 1996.
3. Stern A.C. ed, “ Air Pollution Vol. I, II & III”, Academic Press, New York, 1968
4. Cunniff P.F, “Environmental Noise Pollution”, John Wiley & Sons, New York. 1977.
5. Docks H.M., “Environmental Pollution”, John Wiley & Sons. New York 1981.
6. Chanlett T Emit, “Environmental Protection”, McGraw Hill series in Water Resources and Environmental Engineering, New York. 1973.
7. Patrick C.F, “Environmental noise pollution”, John Wiley & Sons, 1977.

|                                                                                                                                                      |                                                                                                                                                                     |   |   |   |   |
|------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|
| BCE062                                                                                                                                               | ENVIRONMENTAL IMPACT ASSESSMENT                                                                                                                                     | L | T | P | C |
|                                                                                                                                                      | Total Contact Hours - 45                                                                                                                                            | 3 | 0 | 0 | 3 |
|                                                                                                                                                      | Prerequisite – Environmental Engineering                                                                                                                            |   |   |   |   |
|                                                                                                                                                      | Course Designed by – Dept of Civil Engineering                                                                                                                      |   |   |   |   |
| OBJECTIVES:                                                                                                                                          |                                                                                                                                                                     |   |   |   |   |
| 1.To educate the students on the scope, steps involved and various methods related to assessment of environmental impact due to development projects |                                                                                                                                                                     |   |   |   |   |
| COURSE OUTCOMES (COs)                                                                                                                                |                                                                                                                                                                     |   |   |   |   |
| CO1                                                                                                                                                  | To make them understand the basics of EIA and its limitations across sectoral issues and terms of references in EIA. It also includes the study of participation of |   |   |   |   |

|                                                                                                                             |                                                                                                                                         |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|---|
|                                                                                                                             | Public and Non-Governmental Organizations in environmental decision making.                                                             |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO2                                                                                                                         | To understand about the methods and components of EIA and to learn about the expert systems                                             |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO3                                                                                                                         | To understand in detail about the prediction tools for EIA along with the mathematical modeling for impact prediction                   |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO4                                                                                                                         | To improve the knowledge on the ethical and quality aspects of Environmental Impact Assessment                                          |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO5                                                                                                                         | To know in detail about the Case studies of EIA related to the various sectors in a country like infrastructure, sources of energy etc. |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                                                         |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| 1                                                                                                                           | COs/POs                                                                                                                                 | a                                                              | b                           | c | d                  | e                      | f                  | g | h                       | i | j                  | k                                            | l |
| 2                                                                                                                           | CO1                                                                                                                                     | H                                                              |                             |   |                    | M                      |                    |   |                         |   | L                  |                                              |   |
|                                                                                                                             | CO2                                                                                                                                     |                                                                | H                           |   | M                  |                        |                    |   |                         | M |                    |                                              |   |
|                                                                                                                             | CO3                                                                                                                                     | H                                                              |                             |   | H                  |                        | M                  |   |                         |   |                    |                                              |   |
|                                                                                                                             | CO4                                                                                                                                     |                                                                |                             |   |                    |                        |                    | H |                         | M |                    |                                              |   |
|                                                                                                                             | CO5                                                                                                                                     | H                                                              |                             |   |                    |                        |                    |   | M                       | H |                    |                                              |   |
| 3                                                                                                                           | Category                                                                                                                                | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |
|                                                                                                                             |                                                                                                                                         |                                                                |                             |   |                    |                        | √                  |   |                         |   |                    |                                              |   |
| 4                                                                                                                           | Approval                                                                                                                                | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |

## UNIT I INTRODUCTION

9

Environment Impact Assessment (EIA) - Environmental Impact statement – EIA in Project Cycle – Legal and Regulatory aspects in India according to Ministry of Environment and Forests – Types and Limitations of EIA- cross sectoral issues and terms of references in EIA- participation of Public and Non-Governmental Organizations in environmental decision making.

## UNIT II COMPONENTS AND METHODS

9

Components of EIA – Processes – screening – scoping – setting – analysis - mitigation. Matrices-Networks –Checklists – connections and combinations of processes – Cost benefit analysis - Analysis of alternatives - Software packages for EIA-Expert systems in EIA.

## UNIT III PREDICTION, ASSESSMENT OF IMPACTS AND REPORTING

9

Prediction tools for EIA-Mathematical modeling for impact prediction-Assessment of impacts-air-water-soil-noise-biological-socio-cultural environments-Cumulative Impact Assessment-Documentation of EIA findings-planning-organization of information and visual display materials-Report preparation.

## UNIT IV ENVIRONMENTAL MANAGEMENT PLAN

9

Environmental Management Plan-preparation, implementation and review- Mitigation and Rehabilitation Plans-Policy and guidelines for planning and monitoring programmes - post project audit-Ethical and Quality aspects of Environmental Impact Assessment.

**UNIT V CASE STUDIES****9**

Case studies related to the following sectors-Infrastructure-Mining-industrial-Thermal Power – River valley and Hydroelectric-Nuclear Power.

**REFERENCES:**

1. Lawrence, D.P., Environmental Impact Assessment - Practical Solutions to Recurrent Problems, Wiley- Interscience, New Jersey, 2003.
2. Petts, J., Handbook of Environmental Impact Assessment, Vol., I and II, Blackwell Science London, 1999.
3. Canter, L.W., Environmental Impact Assessment, McGraw- Hill, New York, 1996.
4. Biswas, A.K. and Agarwala, S.B.C. Environmental Impact Assessment for Developing Countries, Butterworth Heinemann, London, 1994.
5. The World Bank Group, Environmental Assessment Source Book Vol. I, II and III. The World Bank, Washington, 1991.

**CORE ELECTIVE – III**

|                                                                                                                             |          |                                                                |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
|-----------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|----------|--------------------|----------------------------------------------|
| <b>BCE063</b>                                                                                                               |          | <b>PRESTRESSED CONCRETE STRUCTURES</b>                         |   |                             |   |                    |                        |                    |   | <b>L</b>                | <b>T</b> | <b>P</b>           | <b>C</b>                                     |
|                                                                                                                             |          | Total Contact Hours - 45                                       |   |                             |   |                    |                        |                    |   | 3                       | 0        | 0                  | 3                                            |
|                                                                                                                             |          | Prerequisite – Construction Technology                         |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
|                                                                                                                             |          | Course Designed by – Dept of Civil Engineering                 |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
| <b>OBJECTIVES:</b> To introduce the students to the basic concepts and principles of Prestressed concrete structures        |          |                                                                |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                |          |                                                                |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
| CO1                                                                                                                         |          | To design prestressed concrete beam                            |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
| CO2                                                                                                                         |          | To design prestressed composite beams                          |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
| CO3                                                                                                                         |          | To design flexural members with partial prestressing           |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
| CO4                                                                                                                         |          | To design prestressed concrete tanks, poles and sleepers       |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
| CO5                                                                                                                         |          | To design prestressed concrete bridges                         |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |
| 1                                                                                                                           | COs/POs  | a                                                              | b | c                           | d | e                  | f                      | g                  | h | i                       | j        | k                  | l                                            |
| 2                                                                                                                           | CO1      |                                                                |   | H                           | H |                    |                        |                    |   |                         |          |                    |                                              |
|                                                                                                                             | CO2      |                                                                |   | H                           | H |                    |                        |                    |   |                         |          |                    |                                              |
|                                                                                                                             | CO3      |                                                                |   | H                           | H |                    |                        |                    |   |                         |          |                    |                                              |
|                                                                                                                             | CO4      |                                                                |   | H                           | H |                    |                        |                    |   |                         |          |                    |                                              |
|                                                                                                                             | CO5      |                                                                |   | H                           | H |                    |                        |                    |   |                         |          |                    |                                              |
| 3                                                                                                                           | Category | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |          | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                             |          |                                                                |   |                             |   |                    |                        | √                  |   |                         |          |                    |                                              |
| 4                                                                                                                           | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |                        |                    |   |                         |          |                    |                                              |

**UNIT I INTRODUCTION – THEORY AND BEHAVIOUR 8**

Basic concepts – Advantages – Materials required – Systems and methods of prestressing. Analysis of sections. Stress concept, Strength concept, Load balancing concept -. Effect of loading on the tensile stresses in tendons - Effect of tendon profile on deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections – Losses of prestress – Estimation of crack width.

**UNIT II DESIGN OF END BLOCK 10**

Flexural strength – Simplified procedures as per codes – strain compatibility method – Basic concepts in selection of cross section for bending – stress distribution in end block- Design of anchorage zone reinforcement – Limit state design criteria – Partial prestressing- Applications.

**UNIT III CIRCULAR PRESTRESSING 9**

Design of prestressed concrete tanks – Poles and sleepers

**UNIT IV COMPOSITE CONSTRUCTION 8**

Analysis for stresses – Estimate for deflections – Flexural and shear strength of composite members.

**UNIT V PRESTRESSED CONCRETE BRIDGES 10**

General aspects pretensioned prestressed bridge decks - Post tensioned prestressed bridge decks - Advantages over R.C.bridges - Principles of design only.

**TEXT BOOKS:**

1. Krishna Raju N. “Prestressed concrete”, Tata McGraw Hill Company, New Delhi 2007

**REFERENCES:**

1. MallieS.K.and Gupta A.P. “Prestressed concrete”, Oxford and VB publishing Co. Pvt Ltd., 1987.

|                                                                                                                            |                                                                                |   |   |   |   |
|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|---|---|---|---|
| BCE064                                                                                                                     | ADVANCED CONCRETE DESIGN                                                       | L | T | P | C |
|                                                                                                                            | Total Contact Hours - 45                                                       | 3 | 0 | 0 | 3 |
|                                                                                                                            | Prerequisite – Reinforced Concrete Structures - I                              |   |   |   |   |
|                                                                                                                            | Course Designed by – Dept of Civil Engineering                                 |   |   |   |   |
| <b>OBJECTIVES:</b> To apprise the students about the basics of design of flat slabs, folded plates and cylindrical shells. |                                                                                |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                               |                                                                                |   |   |   |   |
| CO1                                                                                                                        | To study Limit Analysis of beams in Flexure.                                   |   |   |   |   |
| CO2                                                                                                                        | Limit analysis and design of Portal frames                                     |   |   |   |   |
| CO3                                                                                                                        | Analysis and design of orthogrid floors/roofs.                                 |   |   |   |   |
| CO4                                                                                                                        | Analysis and design of prismatic folded plates and circular cylindrical shells |   |   |   |   |
| CO5                                                                                                                        | To study the Design of bunkers and silos.                                      |   |   |   |   |

| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|----------------------------------------------|---|---|---|---|
| 1                                                                                                                           | COs/POs  | a                                                              | b                           | c                  | d                      | e                  | f                       | g                  | h                                            | i | j | k | l |
| 2                                                                                                                           | CO1      |                                                                |                             | H                  | H                      |                    |                         |                    |                                              |   |   |   |   |
|                                                                                                                             | CO2      |                                                                |                             | H                  | H                      |                    |                         |                    |                                              |   |   |   |   |
|                                                                                                                             | CO3      |                                                                |                             | H                  | H                      |                    |                         |                    |                                              |   |   |   |   |
|                                                                                                                             | CO4      |                                                                |                             | H                  | H                      |                    |                         |                    |                                              |   |   |   |   |
|                                                                                                                             | CO5      |                                                                |                             | H                  | H                      |                    |                         |                    |                                              |   |   |   |   |
| 3                                                                                                                           | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |   |   |   |
|                                                                                                                             |          |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| 4                                                                                                                           | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |

### UNIT I LIMIT STATE ANALYSIS OF BEAMS

9

Limit Analysis of beams in Flexure: Behaviour of reinforced concrete members in bending and shear. Plastic hinge Rotation capacity. Factors affecting rotation capacity of a section. Plastic moment. Moment curvature relationship.

Redistribution of moments – Analysis and limit state design of continuous beams.

### UNIT II PORTAL FRAMES

9

Limit Analysis & Design: Limit analysis and design of Portal frames.

### UNIT III DESIGN OF FLAT SLABS

9

Design of Flat Slabs Using BIS 456: Analysis and design of orthogrid floors/roofs.

### UNIT IV PLATES AND SHELLS

9

Analysis and design of prismatic folded plates and circular cylindrical shells using beam approximation.

### UNIT V BUNKERS AND SILOS

9

Design of bunkers and silos.

### TEXT BOOKS:

1. Krishna Raju N, "Advanced Concrete Design", CBS Publishers and Distribution, Delhi, 1988.

### REFERENCES:

1. Jain OP and Jaikrishna, "Plain and reinforced Concrete Vol.2", Nemchand and bros, Roorkee, 1958
2. Dunham C W, "Advanced Concrete Design", Mc Graw Hills Company, 1992
3. Malick and Rangasamy, "Reinforced Concrete Design", Khanna Publishers, Delhi, 1976

|        |                                       |   |   |   |   |
|--------|---------------------------------------|---|---|---|---|
| BCE065 | CONSTRUCTION EQUIPMENT AND MANAGEMENT | L | T | P | C |
|--------|---------------------------------------|---|---|---|---|

|                                                                                                                                                |                                                                                              |                                                                |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|--------------------|----------------------------------------------|---|
|                                                                                                                                                |                                                                                              | Total Contact Hours - 45                                       |   |                             |   |                    |                        |                    |   | 3                       | 0                  | 0                                            | 3 |
|                                                                                                                                                |                                                                                              | Prerequisite – Building Construction                           |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
|                                                                                                                                                |                                                                                              | Course Designed by – Dept of Civil Engineering                 |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| <b>OBJECTIVES:</b><br>To introduce various construction equipment and study the efficient utilization of the same using scientific principles. |                                                                                              |                                                                |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                   |                                                                                              |                                                                |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| CO1                                                                                                                                            | Manage the equipment, cost control and maintenance of a project.                             |                                                                |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| CO2                                                                                                                                            | Identify and understand the working principle of earthwork equipments.                       |                                                                |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| CO3                                                                                                                                            | Identify and understand the working of various equipments for different construction process |                                                                |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| CO4                                                                                                                                            | Identify and understand the working principle of material handling equipments.               |                                                                |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| CO5                                                                                                                                            | Understand the working of aggregate production and concreting equipments.                    |                                                                |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                    |                                                                                              |                                                                |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| 1                                                                                                                                              | COs/POs                                                                                      | a                                                              | b | c                           | d | e                  | f                      | g                  | h | i                       | j                  | k                                            | l |
| 2                                                                                                                                              | CO1                                                                                          | M                                                              |   | M                           |   | H                  |                        |                    |   | L                       |                    |                                              |   |
|                                                                                                                                                | CO2                                                                                          | M                                                              |   | M                           |   | H                  |                        |                    |   |                         |                    |                                              |   |
|                                                                                                                                                | CO3                                                                                          | M                                                              |   | M                           |   | H                  |                        |                    |   |                         |                    |                                              |   |
|                                                                                                                                                | CO4                                                                                          | M                                                              |   | M                           |   | H                  |                        | L                  |   |                         |                    |                                              |   |
|                                                                                                                                                | CO5                                                                                          | M                                                              |   | M                           |   | H                  |                        |                    |   |                         |                    |                                              |   |
| 3                                                                                                                                              | Category                                                                                     | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |
|                                                                                                                                                |                                                                                              |                                                                |   |                             |   |                    |                        | √                  |   |                         |                    |                                              |   |
| 4                                                                                                                                              | Approval                                                                                     | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |

## UNIT I CONSTRUCTION EQUIPMENT MANAGEMENT

10

Identification – Planning - Equipment Management in Projects - Maintenance Management – Replacement - Cost Control of Equipment - Depreciation Analysis – Safety Management.

## UNIT II EQUIPMENT FOR EARTHWORK

10

Fundamentals of Earth Work Operations - Earth Moving Operations - Types of Earth Work Equipment - Tractors, Motor Graders, Scrapers, Front end Waders, Earth Movers.

## UNIT III OTHER CONSTRUCTION EQUIPMENTS

10

Equipment for Dredging, Trenching, Tunneling, Drilling, Blasting - Equipment for Compaction - Erection Equipment - Types of pumps used in Construction - Equipment for Dewatering and Grouting – Foundation and Pile Driving Equipment – Equipment for Demolition.

## UNIT IV MATERIALS HANDLING EQUIPMENT

5

Forklifts and related equipment - Portable Material Bins – Conveyors – Hauling Equipment.

**UNIT V EQUIPMENT FOR PRODUCTIO OF AGGREGATE AND CONCRETING 10**

Crushers – Feeders - **Screening Equipment - Handling Equipment** - Batching and Mixing Equipment - Hauling, Pouring and Pumping Equipment – Transporters.

**REFERENCES:**

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., Construction Planning, Equipment and Methods, McGraw Hill, Singapore, 2006.
2. Sharma S.C. Construction Equipment and Management, Khanna Publishers, New Delhi, 1988.
3. Deodhar, S.V. Construction Equipment and Job Planning, Khanna Publishers, New Delhi, 1988.
4. Dr.Mahesh Varma, Construction Equipment and its planning and Application, Metropolitan Book Company, New Delhi. 1983.

|                                                                                                                             |                                                                                         |   |   |   |   |   |   |          |          |          |          |   |   |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|---|---|---|---|---|---|----------|----------|----------|----------|---|---|
| <b>BCE066</b>                                                                                                               | <b>PREFABRICATION AND CONSTRUCTION TECHNIQUES</b>                                       |   |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |
|                                                                                                                             | Total Contact Hours - 45                                                                |   |   |   |   |   |   | 3        | 0        | 0        | 3        |   |   |
|                                                                                                                             | Prerequisite – Construction Technology                                                  |   |   |   |   |   |   |          |          |          |          |   |   |
|                                                                                                                             | Course Designed by – Dept of Civil Engineering                                          |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>OBJECTIVES:</b>                                                                                                          |                                                                                         |   |   |   |   |   |   |          |          |          |          |   |   |
| To bring about an understanding of the prefabrication and construction techniques adopted                                   |                                                                                         |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                |                                                                                         |   |   |   |   |   |   |          |          |          |          |   |   |
| CO1                                                                                                                         | Know the standardization and tolerances-system for prefabrication                       |   |   |   |   |   |   |          |          |          |          |   |   |
| CO2                                                                                                                         | Understand the Pre-casting and handling techniques                                      |   |   |   |   |   |   |          |          |          |          |   |   |
| CO3                                                                                                                         | Know the Curing techniques including accelerated curing.                                |   |   |   |   |   |   |          |          |          |          |   |   |
| CO4                                                                                                                         | Know the Pre-cast and pre-fabricating technology for low cost and mass housing schemes. |   |   |   |   |   |   |          |          |          |          |   |   |
| CO5                                                                                                                         | Understand the Repairs and economical aspects on prefabrication                         |   |   |   |   |   |   |          |          |          |          |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                         |   |   |   |   |   |   |          |          |          |          |   |   |
| 1                                                                                                                           | COs/POs                                                                                 | a | b | c | d | e | f | g        | h        | i        | j        | k | l |
| 2                                                                                                                           | CO1                                                                                     | M |   | M |   | H |   |          |          | L        |          |   |   |
|                                                                                                                             | CO2                                                                                     | M |   | M |   | H |   |          |          |          |          |   |   |
|                                                                                                                             | CO3                                                                                     | M |   | M |   | H |   |          |          |          |          |   |   |
|                                                                                                                             | CO4                                                                                     | M |   | M |   | H |   |          |          |          |          |   |   |
|                                                                                                                             | CO5                                                                                     | M |   | M |   | H |   |          |          |          |          |   |   |

|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                             |
|---|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---------------------------------------------|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/Seminar/ Internship (PR) |
|   |          |                                                                |                             |                    |                        | √                  |                         |                    |                                             |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                             |

### **UNIT I INTRODUCTION 9**

Materials - Modular co-ordination, standardization and tolerances-system for prefabrication. Pre-cast concrete manufacturing techniques, Moulds – **construction design, maintenance and repair.**

### **UNIT II TECHNIQUES OF PRE-CASTING 9**

Pre-casting techniques - Planning, analysis and design considerations - Handling techniques - Transportation Storage and erection of structures.

### **UNIT III INDUSTRIAL STRUCTURES 9**

Joints -Curing techniques including accelerated curing such as steam curing, hot air blowing etc., -Test on precast elements - **skeletal and large panel constructions - Industrial structures.**

### **UNITIV APPLICATIONS 9**

**Pre-cast and pre-fabricating technology** for low cost and mass housing schemes. Small pre-cast products like door frames, shutters, Ferro-cement in housing - Water tank service core unit.

### **UNIT V QUALITY CONTROL 9**

Quality control - Repairs and economical aspects on prefabrication.

### **REFERENCES:**

1. Levitt. M., Precast concrete - Materials, Manufacture Properties and Usage, Applied Science Pubs. 1982,
2. Konex.T., Handbook of Pre-cast Construction, Vol.1.2&3.
3. Richardson,J.G., Pre-cast concrete Production, Cement and Concrete Association, London, 1973.
4. Madhava Rao.A-G., Modern Trends in Housing in Developing Countries, Oxford & UBH Publishing co., 1985. -
5. Lewicki.B., Building with Large Pre-fabrications, Elsevier Publishers.
6. Large Panel Prefabricated Constructions, Proc. of Advance Course conducted by SERC, Madras.
7. Bruggeling.A.S.G., & Huyghe.G.F., Prefabrication with Concrete, A.s.A., Balkema Publishers, Netherland, 1991.

|               |                                                |          |          |          |          |
|---------------|------------------------------------------------|----------|----------|----------|----------|
| <b>BCE067</b> | <b>ENVIRONMENTAL HEALTH ENGINEERING</b>        | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|               | Total Contact Hours - 45                       | 3        | 0        | 0        | 3        |
|               | Prerequisite – Environmental Engineering       |          |          |          |          |
|               | Course Designed by – Dept of Civil Engineering |          |          |          |          |

|                                                                                                                                |                                                                                |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
| <b>OBJECTIVES:</b>                                                                                                             |                                                                                |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| 1. To introduce types of pollution and its impacts                                                                             |                                                                                |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| 2. To acquaint the student with various methods and techniques of disposing and management of waste                            |                                                                                |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| 3. To give an insight into the various diseases that affect human beings and introduces the importance of sanitation processes |                                                                                |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                   |                                                                                |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO1                                                                                                                            | To learn about the air pollutants, sources and its effects.                    |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO2                                                                                                                            | To have a clear understanding on the air quality standards and its techniques. |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO3                                                                                                                            | To determine the fluid resistance for organic materials.                       |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO4                                                                                                                            | To find the Properties of air pollution and its control measures.              |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO5                                                                                                                            | To learn about the effects and the sources of noise pollution.                 |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low    |                                                                                |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| 1                                                                                                                              | COs/POs                                                                        | a                                                              | b | c                           | d | e                  | f                      | g                  | h | i                       | j | k                  | l                                            |
| 2                                                                                                                              | CO1                                                                            | H                                                              | L |                             |   |                    | M                      | H                  |   |                         |   |                    |                                              |
|                                                                                                                                | CO2                                                                            |                                                                |   | H                           |   |                    |                        |                    |   | L                       |   |                    | M                                            |
|                                                                                                                                | CO3                                                                            |                                                                | M |                             | H |                    |                        | H                  |   | H                       |   |                    |                                              |
|                                                                                                                                | CO4                                                                            | H                                                              |   |                             |   |                    |                        |                    | M | M                       |   |                    |                                              |
|                                                                                                                                | CO5                                                                            |                                                                |   |                             | H |                    |                        |                    |   | H                       |   |                    |                                              |
| 3                                                                                                                              | Category                                                                       | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                                |                                                                                |                                                                |   |                             |   |                    |                        | √                  |   |                         |   |                    |                                              |
| 4                                                                                                                              | Approval                                                                       | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |

## UNIT I INTRODUCTION

9

Definition of clean air, nature, air pollutants, sources of air pollutants, effects of air pollution on man, animal, vegetation and properties.

## UNIT II AMBIENT AIR QUALITY STANDARDS AND AIR QUALITY MONITORING

10

Harmful concentration – geographical factors in air pollution – air pollution control legislation. Classification sampling; sampling techniques; monitoring atmospheric pollution.

## UNIT III FLUID RESISTANCE TO PARTICLE MOTION

9

Principles of removal of a gaseous constituent; adsorption and combustion; catalytic combustion of organic materials; catalytic oxidation and decomposition.

## UNIT IV AIR POLLUTION AND CONTROL MEASURES

9

Setting chambers; momentum separators, fibrous filters; electro static precipitators; bag houses centrifugal spray scrubbers; venture scrubbers; elementary principles of air pollution e-control techniques.

## UNIT V NOISE POLLUTION

8

Sound and noise; sources of noise pollution, environmental and industrial noise; effects of noise pollution: measures for prevention and control of noise; environmental and industrial noise; noise control legislation.

### TEXT BOOKS:

1. Anjaneyulu D., “Air Pollution and Control Technologies”, Allied Publishers, Mumbai, 2002.

### REFERENCES:

1. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.
2. Rao M.N., and Rao H. V. N., Air Pollution Control, Tata-McGraw-Hill, New Delhi, 1996.
3. Stern A.C. ed, “ Air Pollution Vol. I, II & III”, Academic Press, New York, 1968
4. Cunniff P.F, “Environmental Noise Pollution”, John Wiley & Sons, New York. 1977.
5. Docks H.M., “Environmental Pollution”, John Wiley & Sons. New York 1981.
6. Chanlett T Emit,”Environmental Protection”, McGraw Hill series in Water Resources and Environmental Engineering, New York. 1973.
7. Patrick C.F,”Environemental noise pollution”, John Wiley & Sons, 1977.

|                                                                                                                             |                                                                                                                                                    |                                                |   |   |   |   |   |   |   |   |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|
| BCE068                                                                                                                      |                                                                                                                                                    | INDOOR AIR QUALITY                             |   |   |   |   |   |   |   | L | T | P | C |
|                                                                                                                             |                                                                                                                                                    | Total Contact Hours - 45                       |   |   |   |   |   |   |   | 3 | 0 | 0 | 3 |
|                                                                                                                             |                                                                                                                                                    | Prerequisite – Environmental Studies           |   |   |   |   |   |   |   |   |   |   |   |
|                                                                                                                             |                                                                                                                                                    | Course Designed by – Dept of Civil Engineering |   |   |   |   |   |   |   |   |   |   |   |
| OBJECTIVES:                                                                                                                 |                                                                                                                                                    |                                                |   |   |   |   |   |   |   |   |   |   |   |
| To educate the students on air pollution and control in the indoor environment.                                             |                                                                                                                                                    |                                                |   |   |   |   |   |   |   |   |   |   |   |
| COURSE OUTCOMES (COs)                                                                                                       |                                                                                                                                                    |                                                |   |   |   |   |   |   |   |   |   |   |   |
| CO1                                                                                                                         | To make them understand the fundamentals of Design and operation of buildings for improvements of public health associated with indoor air quality |                                                |   |   |   |   |   |   |   |   |   |   |   |
| CO2                                                                                                                         | To understand about the air pollutants in indoor environments and its characteristics, consequences                                                |                                                |   |   |   |   |   |   |   |   |   |   |   |
| CO3                                                                                                                         | To understand in detail about the classification and control of pollutants and case studies associated with it.                                    |                                                |   |   |   |   |   |   |   |   |   |   |   |
| CO4                                                                                                                         | To improve the knowledge on the Concepts and tools in indoor air quality along with the statistical models associated with it.                     |                                                |   |   |   |   |   |   |   |   |   |   |   |
| CO5                                                                                                                         | To know about the basics of the Indoor air pollution from outdoor sources.                                                                         |                                                |   |   |   |   |   |   |   |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                                                                    |                                                |   |   |   |   |   |   |   |   |   |   |   |
| 1                                                                                                                           | COs/POs                                                                                                                                            | a                                              | b | c | d | e | f | g | h | i | j | k | l |
| 2                                                                                                                           | CO1                                                                                                                                                | H                                              |   |   |   |   |   | M |   | H |   |   |   |
|                                                                                                                             | CO2                                                                                                                                                | M                                              | H |   | M |   |   |   |   | H |   |   |   |
|                                                                                                                             | CO3                                                                                                                                                | H                                              |   |   |   |   |   |   |   |   |   | H |   |
|                                                                                                                             | CO4                                                                                                                                                | H                                              |   |   |   |   |   |   |   | M |   |   |   |

|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |  |  |  |
|---|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|----------------------------------------------|---|--|--|--|
|   | CO5      |                                                                | M                           |                    |                        |                    | H                       |                    |                                              | H |  |  |  |
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |  |  |  |
|   |          |                                                                |                             |                    |                        | √                  |                         |                    |                                              |   |  |  |  |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                              |   |  |  |  |

## UNIT I INTRODUCTION

9

Indoor activities of inhabitants – residence time. Levels of many pollutants in indoor and outdoor air. Design and operation of buildings for improvements of public health. IAQ policy issues: Sustainability; indoor air quality as a basic human right

## UNIT II INDOOR AIR POLLUTANTS

9

Air pollutants in indoor environments, private residences, offices, schools and public buildings, factors that govern pollutant indoors concentrations, including ventilation. Characteristics, Consequences.

## UNIT III CONTROL OF POLLUTANTS

9

Control of several pollutant classes, such as radon, toxic organic gases, combustion byproducts, and microorganisms such as molds and infectious bacteria. Case study by an exploration of public policy related to indoor air.

## UNIT IV CONCEPT AND TOOLS

9

Concepts and tools: exposure, material-balance models, statistical models ventilation.

## UNIT V INDOOR AIR POLLUTION FROM OUTDOOR SOURCES

9

Indoor air pollution from outdoor sources: particulate matter and ozone; Combustion byproducts; Radon and its decay products. Volatile organic compounds: odors and sick-building syndrome, Humidity Bio-aerosols: infectious disease transmission. Special indoor environments: A/C units in indoor: museums -labs; Measurement methods, Control Technologies, Control strategies.

## REFERENCES:

1. Thaddes Godish, Indoor air and Environment Quality, CRC press, 2000.
2. Nazaroff W.W and L Aivarez-Cohen, Environmental Engineering Science Wiley Sons, New York, 2001.
3. Moroni Marco, Seifet Bernd and Lindrall Thomas, Indoor Air Quality: A Comprehensive Reference Book, Elsevier Science. Vol.3, 1995.

## NON MAJOR ELECTIVE-I

|               |                                               |          |          |          |          |
|---------------|-----------------------------------------------|----------|----------|----------|----------|
| <b>BCE069</b> | <b>MATRIX METHODS AND STRUCTURAL ANALYSIS</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|---------------|-----------------------------------------------|----------|----------|----------|----------|

|                                                                                                                                                                                                      |          |                                                                                                        |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
|                                                                                                                                                                                                      |          | Total Contact Hours - 45                                                                               |   |                             |   |                    |                        | 3                  | 0 | 0                       | 3 |                    |                                              |
|                                                                                                                                                                                                      |          | Prerequisite – Structural analysis-II                                                                  |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                                                      |          | Course Designed by – Dept of Civil Engineering                                                         |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| <b>OBJECTIVES:</b><br>To introduce the students to advanced methods of analysis like matrix methods, structural analysis stiffness method, Flexibility method and also analysis of space structures. |          |                                                                                                        |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                                         |          |                                                                                                        |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO1                                                                                                                                                                                                  |          | Apply the basic concepts of matrix methods in structural Analysis                                      |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO2                                                                                                                                                                                                  |          | Find out the deflections in beams and trusses using various methods                                    |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO3                                                                                                                                                                                                  |          | Analyze the structures using flexibility and stiffness method                                          |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO4                                                                                                                                                                                                  |          | Determine member forces using element and system matrices for determinate and indeterminate structures |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO5                                                                                                                                                                                                  |          | Determine the forces in various members due to lack of fit and thermal expansion.                      |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                                                          |          |                                                                                                        |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| 1                                                                                                                                                                                                    | COs/POs  | a                                                                                                      | b | c                           | d | e                  | f                      | g                  | h | i                       | j | k                  | l                                            |
| 2                                                                                                                                                                                                    | CO1      | M                                                                                                      |   | M                           | H | H                  |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                                                      | CO2      | M                                                                                                      |   | M                           | H |                    |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                                                      | CO3      | M                                                                                                      |   | M                           | H |                    |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                                                      | CO4      | M                                                                                                      |   | M                           | H |                    |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                                                      | CO5      | M                                                                                                      |   | M                           | H |                    |                        |                    |   |                         |   |                    |                                              |
| 3                                                                                                                                                                                                    | Category | Humanities & Social Studies (HS)                                                                       |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                                                                                                      |          |                                                                                                        |   |                             |   |                    |                        |                    |   | √                       |   |                    |                                              |
| 4                                                                                                                                                                                                    | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016                                         |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |

## **UNIT I ANALYSIS OF INDETERMINATE STRUCTURES 9**

Concept of Indeterminate Structural Analysis –Indeterminacy - flexibility method stiffness method – choice of method.

## **UNIT II STIFFNESS METHOD 9**

Stiffness Method: Three dimensional structures – space trusses – grid structures – rigid frame structures.

## **UNIT III ANALYSIS OF SUBSTRUCTURE 9**

Analysis of Structural system using substructure: Basic concepts – analysis of substructure – simple examples.

## **UNIT IV FLEXIBILITY METHOD 9**

Flexibility method: Trusses, beams and space frames.

**UNIT V COMPUTER APPLICATIONS****9**

Preparation of Computer Programmes: Trusses – beam – space frames

**TEXT BOOKS:**

1. L.S. Negi & R.S. Jangid, “Structural Analysis”, Tata McGraw-Hill Publications, New Delhi, 2003.

**REFERENCES:**

1. BhaviKatti, S.S, “Structural Analysis – Vol. 1 Vol. 2”, Vikas Publishing House Pvt. Ltd., New Delhi, 2008
2. William Weaver, “Computer Programs for Structural Analysis”, Van Nostrand, 1967)
3. Rubinstein M.E, “Matrix Computer Analysis of Structures”, Prentice Hall, 1969.

|                                                                                                                                                 |          |                                                                                   |   |                             |   |                    |                        |                    |                         |   |                    |                                              |   |
|-------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|-------------------------|---|--------------------|----------------------------------------------|---|
| BCE070                                                                                                                                          |          | CONCRETE STRUCTURES                                                               |   |                             |   |                    |                        |                    |                         | L | T                  | P                                            | C |
|                                                                                                                                                 |          | Total Contact Hours - 45                                                          |   |                             |   |                    |                        |                    |                         | 3 | 0                  | 0                                            | 3 |
|                                                                                                                                                 |          | Prerequisite – Reinforced Concrete Structures - I                                 |   |                             |   |                    |                        |                    |                         |   |                    |                                              |   |
|                                                                                                                                                 |          | Course Designed by – Dept of Civil Engineering                                    |   |                             |   |                    |                        |                    |                         |   |                    |                                              |   |
| OBJECTIVES: To study the properties of concrete making materials, tests, mix design, special concretes and various methods for making concrete. |          |                                                                                   |   |                             |   |                    |                        |                    |                         |   |                    |                                              |   |
| COURSE OUTCOMES (COs)                                                                                                                           |          |                                                                                   |   |                             |   |                    |                        |                    |                         |   |                    |                                              |   |
| CO1                                                                                                                                             |          | To learn about calculation of deflection and crack width according to IS 456-2000 |   |                             |   |                    |                        |                    |                         |   |                    |                                              |   |
| CO2                                                                                                                                             |          | To know about design of special RC elements.                                      |   |                             |   |                    |                        |                    |                         |   |                    |                                              |   |
| CO3                                                                                                                                             |          | To Design flat slabs and flat plates according to ACI method.                     |   |                             |   |                    |                        |                    |                         |   |                    |                                              |   |
| CO4                                                                                                                                             |          | To know about the inelastic behavior of concrete beams.                           |   |                             |   |                    |                        |                    |                         |   |                    |                                              |   |
| CO5                                                                                                                                             |          | To analyze problems based on detailing for ductility.                             |   |                             |   |                    |                        |                    |                         |   |                    |                                              |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                     |          |                                                                                   |   |                             |   |                    |                        |                    |                         |   |                    |                                              |   |
| 1                                                                                                                                               | COs/POs  | a                                                                                 | b | c                           | d | e                  | f                      | g                  | h                       | i | j                  | k                                            | l |
| 2                                                                                                                                               | CO1      | H                                                                                 |   |                             | H | H                  |                        |                    |                         |   |                    |                                              |   |
|                                                                                                                                                 | CO2      | H                                                                                 |   |                             | H | H                  |                        |                    |                         |   |                    |                                              |   |
|                                                                                                                                                 | CO3      | H                                                                                 |   |                             | H | H                  |                        |                    |                         |   |                    |                                              |   |
|                                                                                                                                                 | CO4      | H                                                                                 | M |                             | H | H                  |                        |                    |                         |   |                    |                                              |   |
|                                                                                                                                                 | CO5      | H                                                                                 |   |                             | H | H                  | M                      |                    |                         |   |                    |                                              |   |
| 3                                                                                                                                               | Category | Humanities & Social Studies (HS)                                                  |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |
|                                                                                                                                                 |          |                                                                                   |   |                             |   |                    |                        |                    |                         |   |                    |                                              |   |
| 4                                                                                                                                               | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016                    |   |                             |   |                    |                        |                    |                         |   |                    |                                              |   |

**UNIT I INTRODUCTION****9**

Review of limits state design of beams, Slabs and columns according to IS: 456-2000  
Calculation of deflection and crack width according to IS 456-2000.

**UNIT II DESIGN OF SPECIAL RC ELEMENTS****11**

Design of Slender columns - Design of Retwalls - Ordinary and shear walls - Design of Corbels - Deep beams and grid floors.

**UNIT III FLAT SLABS AND FLAT PLATES****10**

Design of flat slabs and flat plates according to ACI method - Design of shear load - reinforcement and edge (Spandrel) beams - Yield line theory and Hillerberg method of design of slabs.

**UNIT IV INELASTIC BEHAVIOUR OF CONCRETE BEAMS****9**

In elastic behavior of concrete beams - moment - rotation curves - moment redistribution - Baker's method of plastic design, Design of cast in situ Joints in frames.

**UNIT V GENERAL****6**

Detailing for ductility - Fire resistance of buildings - field control of concrete.

**REFERENCES:**

1. Purushothaman P, Reinforced Concrete Structural Elements: Behaviour Analysis and Design, Tata McGraw Hill, 1986.
2. Varghese P. C., Limit State Design of Reinforced Concrete, Prentice Hall of India, 1995.
3. Krishna Raju, N. Advanced Reinforced Concrete Design, CBS Publishers and Distributors, 1986.
4. N. C. Sinha, S. K. Roy, Fundamentals of Reinforced concrete, S. Chand & Company Ltd, 2001.
5. Varghese. P. C. Advanced Reinforced concrete design, Prentice Hall of India, 2005.

|                                                                                                                                                                                                                      |                                                                     |          |          |          |          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|----------|----------|----------|----------|
| <b>BCE071</b>                                                                                                                                                                                                        | <b>SHORING, SCAFFOLDING AND FORMWORK</b>                            | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                                                                                                                                      | Total Contact Hours - 45                                            | 3        | 0        | 0        | 3        |
|                                                                                                                                                                                                                      | Prerequisite – Construction Technology                              |          |          |          |          |
|                                                                                                                                                                                                                      | Course Designed by – Dept of Civil Engineering                      |          |          |          |          |
| <b>OBJECTIVES:</b><br>1. To bring about a thorough exposure to shoring, scaffolding and formwork procedures in construction practice by studying the materials, planning and design aspects and erection procedures. |                                                                     |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                                                         |                                                                     |          |          |          |          |
| CO1                                                                                                                                                                                                                  | Study the materials associated with formwork.                       |          |          |          |          |
| CO2                                                                                                                                                                                                                  | Study the design aspects of formwork under various requirements.    |          |          |          |          |
| CO3                                                                                                                                                                                                                  | Know the design of forms and shores                                 |          |          |          |          |
| CO4                                                                                                                                                                                                                  | Study the planning and erection aspects of form work for buildings. |          |          |          |          |
| CO5                                                                                                                                                                                                                  | Understand few other special types of forms.                        |          |          |          |          |
| Mapping of Course Outcomes with Program outcomes (POs)                                                                                                                                                               |                                                                     |          |          |          |          |

| (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
|-------------------------------------------------------------------|----------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|---|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
| 1                                                                 | COs/POs  | a                                                              | b | c                           | d | e                  | f                      | g | h                  | i | j                       | k | l                  |                                              |
| 2                                                                 | CO1      |                                                                |   | M                           |   | H                  | M                      |   |                    |   |                         |   |                    |                                              |
|                                                                   | CO2      |                                                                |   | M                           |   | H                  | M                      |   | L                  |   |                         |   |                    |                                              |
|                                                                   | CO3      |                                                                |   | M                           |   | H                  | M                      |   |                    |   |                         |   |                    |                                              |
|                                                                   | CO4      |                                                                |   | M                           |   | H                  | M                      |   |                    |   |                         |   |                    |                                              |
|                                                                   | CO5      |                                                                |   | M                           |   | H                  | M                      |   |                    |   |                         |   |                    |                                              |
| 3                                                                 | Category | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                   |          |                                                                |   |                             |   |                    |                        |   |                    |   | √                       |   |                    |                                              |
| 4                                                                 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |

### UNIT I PLANNING AND SITE EQUIPMENT & PLANT FOR FORM WORK 9

At Tender stage – Development of basic system – Planning for maximum reuse – Economical form construction – Planning examples – Crane size, effective scheduling estimate – Recheck plan details – Detailing the forms. Overall Planning – detail planning – Standard units – Corner units – Schedule for column formwork – Formwork elements – Planning Crane arrangements – Site layout plan – Transporting plant – Formwork beams – Formwork ties – Wales and ties – scaffold frames from accessories – Vertical transport table form work.

### UNIT II FORM MATERIALS

9

Lumber – Types – Finish – Sheathing boards working stresses – Repetitive member stress – Plywood – Types and grades – Textured surfaces and strength – Reconstituted wood – Steel – Aluminium Form lining materials – Hardware and fasteners – Nails in Plywood Concrete density – Height of discharge – Temperature – Rates of Placing – Consistency of concrete – Live loads and wind pressure – Vibration Hydrostatic pressure and pressure distribution – Examples – Vertical loads - Uplift on shores – Adjustment for non standard conditions.

### UNIT III DESIGN OF FORMS AND SHORES

9

Basic simplification – Beam formulas – Allowable stresses – Deflection bending lateral stability – Shear, Bearing – Examples in wall forms – Slab forms – Beam forms – Ties, Anchors and Hangers – Column forms – Examples in each. Simple wood stresses – Slenderness ratio – Allowable load – Tubular steel shores patented shores – Site Preparation, Size and spacing – Steel Tower Frames – Safety practices – Horizontal shores shoring for multistories – More concentrated shore loads T- heads – Tow Tier wood shores – Ellis shores – Dayton sure grip and Baker Roofs shores – Safeway Symons shores – Beaver – advance shores Dead shore – Raking and Flying shores.

### UNIT IV FORMWORK FOR BUILDINGS

9

Location of job mill – Storage – Equipment – Footings – Wall footings – Column footings Sloped footing forms – Curb and gutter forms – Wall forms –Prefabricated panel systems – Giant forms curved wall forms – Column heads – Beam or girder forms – Beam pockets – Suspended forms – Concrete joint construction – Flying system forms. Causes of failures –

Inadequate shoring inadequate bracing of members – improper vibration – Premature stripping – Errors in design – Failure to follow codes – How formwork affects concrete quality – ACI – Case studies – Finish of exposed concrete design deficiencies – Safety factors – Prevention of rotation – Stripping sequence – Advantages of reshoring.

## **UNIT V      FORMS FOR DOMES AND TUNNELS, SLIP FORMS AND SAFETY PRACTICES FOR SCAFFOLDS**

**9**

Hemispherical, Parabolic, Translational typical barrel vaults, Hyperbolic Folded plates– Shell form design considerations loads – Inserts , Anchors bolts – Building the forms-Placing concrete – Form removed – Strength requirements – Tunnel forming components – Curb forms invert forms – Arch forms – Concrete placement methods – Cut and cover construction – Tolerances – Form construction – Shafts. Slip Forms -Principles – Types – advantages – Functions of various components – Planning – Desirable characteristics of concrete – Common problems faced – Safety in slip forms special structures built with slip form Technique – Codal provisions Types of scaffolds – Putlog and independent scaffold – Single pole scaffolds – Fixing ties – Spacing of ties plan – bracing – knots – safety net – General safety requirements – precautions against particular hazards – Truss suspended – Gantry and system scaffolds.

### **REFERENCES:**

1. Robert L. Peurifoy and Garold D. Oberlender, Formwork For Concrete Structures, McGraw – Hill , 1996.
2. Hurd, M.K., Formwork for Concrete, Special Publication No.4, American Concrete Institute, Detroit, 1996
3. Michael P. Hurst, Construction Press, London & New York, 2003
4. Austin, C.K., Formwork for Concrete, Cleaver – Hume Press Ltd., London, 1996.

|                                                                                                                                                                                                                |                                                                                        |   |   |   |   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|---|---|---|---|
| BCE072                                                                                                                                                                                                         | CONSTRUCTION PROJECT MANAGEMENT                                                        | L | T | P | C |
|                                                                                                                                                                                                                | Total Contact Hours - 45                                                               | 3 | 0 | 0 | 3 |
|                                                                                                                                                                                                                | Prerequisite – Building Construction                                                   |   |   |   |   |
|                                                                                                                                                                                                                | Course Designed by – Dept of Civil Engineering                                         |   |   |   |   |
| <b>OBJECTIVES:</b><br>To study the elements of construction project management; consisting of owners’ perspective, organization, design and construction procedures, resource utilization and cost estimation. |                                                                                        |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                                                   |                                                                                        |   |   |   |   |
| CO1                                                                                                                                                                                                            | Know the types and financing of construction and changing Environment of the industry. |   |   |   |   |
| CO2                                                                                                                                                                                                            | Understand the organisation of project management                                      |   |   |   |   |
| CO3                                                                                                                                                                                                            | Know the design and construction process as an integrated system.                      |   |   |   |   |
| CO4                                                                                                                                                                                                            | Know the labour, material and equipment utilization                                    |   |   |   |   |
| CO5                                                                                                                                                                                                            | Understand Cost Estimates and the Costs Associated with Construction Facilities.       |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)                                                                                                                                                         |                                                                                        |   |   |   |   |

| (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
|-------------------------------------------------------------------|----------|----------------------------------------------------------------|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|---|
| 1                                                                 | COs/POs  | a                                                              | b                           | c | d                  | e                      | f                  | g | h                       | i | j                  | K                                            | l |
| 2                                                                 | CO1      | M                                                              |                             |   |                    | L                      | M                  |   | M                       |   |                    |                                              |   |
|                                                                   | CO2      | M                                                              |                             |   |                    |                        | M                  |   | M                       |   |                    |                                              |   |
|                                                                   | CO3      | M                                                              |                             |   |                    |                        | M                  |   | M                       |   | L                  |                                              |   |
|                                                                   | CO4      | M                                                              |                             |   |                    |                        | M                  |   | M                       |   |                    |                                              |   |
|                                                                   | CO5      | M                                                              |                             |   |                    |                        | M                  |   | M                       |   |                    |                                              |   |
| 3                                                                 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |
|                                                                   |          |                                                                |                             |   |                    |                        |                    |   | √                       |   |                    |                                              |   |
| 4                                                                 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |

## UNIT I THE OWNERS' PERSPECTIVE

9

Introduction - Project Life Cycle - Types of Construction - Selection of Professional Services - Construction Contractors - Financing of Constructed Facilities - Legal and Regulatory Requirements - Changing Environment of the Construction Industry - Role of Project Managers

## UNIT II ORGANIZING FOR PROJECT MANAGEMENT

9

Project Management – modern trends - Strategic Planning - Effects of Project Risks on Organization - Organization of Project Participants -Traditional Designer- Constructor Sequence - Professional Construction Management - Owner-Builder Operation - Turnkey Operation - Leadership and Motivation for the Project Team

## UNIT III DESIGN AND CONSTRUCTION PROCESS

9

Design and Construction as an Integrated System - Innovation and Techno logical Feasibility - Innovation and Economic Feasibility - Design Methodology - Functional Design - Construction Site Environment

## UNIT IV LABOUR, MATERIAL AND EQUIPMENT UTILIZATION

9

Historical Perspective - Labour Productivity - Factors Affecting Job-Site Productivity - Labour Relations in Construction - Problems in Collective Bargaining - Materials Management - Material Procurement and Delivery - Inventory Control - Tradeoffs of Costs in Materials Management. - Construction Equipment - Choice of Equipment and Standard Production Rates - Construction Processes Queues and Resource Bottlenecks

## UNIT V COST ESTIMATION

9

Costs Associated with Constructed Facilities - Approaches to Cost Estimation - Type of Construction Cost Estimates - Effects of Scale on Construction Cost - Unit Cost Method of Estimation - Methods for Allocation of Joint Costs - Historical Cost Data - Cost Indices - Applications of Cost Indices to Estimating - Estimate Based on Engineer's List of Quantities - Estimation of Operating Costs.

## REFERENCES:

1. Chris Hendrickson and Tung Au, Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.
2. Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, Tata McGraw-Hill Publishing Company, New Delhi, 1998.
3. Frederick E. Gould, Construction Project Management, Wentworth Institute of Technology, Vary E. Joyce, Massachusetts Institute of Technology, 2000.
4. Choudhury, S, Project Management, Tata McGraw-Hill Publishing Company, New Delhi, 1988.
5. George J.Ritz , Total Construction Project Management - McGraw-Hill Inc, 1994.

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|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|---|
| BCE073                                                                                                                      | GROUND WATER CONTAMINATION AND TRANSPORT MODELING                                                                                     |                                                                |   |                             |   |                    |                        |                    |   |                         | L | T                  | P                                            | C |
|                                                                                                                             | Total Contact Hours - 45                                                                                                              |                                                                |   |                             |   |                    |                        |                    |   |                         | 3 | 0                  | 0                                            | 3 |
|                                                                                                                             | Prerequisite – Transportation Engineering                                                                                             |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
|                                                                                                                             | Course Designed by – Dept of Civil Engineering                                                                                        |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| OBJECTIVES: To educate the students on the hydraulics related ground water contamination and modeling ground water quality. |                                                                                                                                       |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| COURSE OUTCOMES (COs)                                                                                                       |                                                                                                                                       |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO1                                                                                                                         | To make them understand the fundamentals of Ground water and the various hydrologic cycles.                                           |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO2                                                                                                                         | To understand about the various steady state hydrologic budgets and various case studies associated with it.                          |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO3                                                                                                                         | To understand in detail about the development of Ground Water resources and Aquifers.                                                 |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO4                                                                                                                         | To improve the knowledge on the basics of Chemical equilibrium and Geochemical interpretation of <sup>14</sup> C Dates                |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO5                                                                                                                         | To know about the basics of the Transport process in solute transfer and hydro chemical behavior of contaminants in the ground water. |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                                                       |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| 1                                                                                                                           | COs/POs                                                                                                                               | a                                                              | b | c                           | d | e                  | f                      | g                  | h | i                       | j | k                  | l                                            |   |
| 2                                                                                                                           | CO1                                                                                                                                   | H                                                              | H |                             |   |                    | M                      |                    |   |                         | L |                    |                                              |   |
|                                                                                                                             | CO2                                                                                                                                   |                                                                | H | H                           |   |                    |                        |                    |   | M                       |   |                    |                                              |   |
|                                                                                                                             | CO3                                                                                                                                   | H                                                              | H |                             |   |                    |                        |                    | H | H                       | L |                    |                                              |   |
|                                                                                                                             | CO4                                                                                                                                   |                                                                |   |                             |   |                    |                        |                    |   | M                       |   |                    |                                              |   |
|                                                                                                                             | CO5                                                                                                                                   | H                                                              | M |                             |   |                    | H                      |                    | W |                         |   |                    |                                              |   |
| 3                                                                                                                           | Category                                                                                                                              | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |
|                                                                                                                             |                                                                                                                                       |                                                                |   |                             |   |                    |                        |                    |   | √                       |   |                    |                                              |   |
| 4                                                                                                                           | Approval                                                                                                                              | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |

**UNIT I INTRODUCTION****9**

Ground water and the hydrologic cycles – Ground water as resources – Ground water contamination – Water quality standards – Sources of contamination – Land disposal of solid wastes – Sewage disposal on Land. Ground water and geologic processes. Physical properties and principles – Darcy's Law – Hydraulic Head and Fluid Potential – Piezometers and Nestes. Hydraulic conductivity and permeability – Homogeneity and Anisotropy – Porosity and voids Ratio – Unsaturated flow and the water table – steady state flow and transient flow – Compressibility and effective stress – Transmissivity and storability – Equations of ground water flow – Limitations of Darcian Approach – Hydro dynamic dispersion – Case Studies.

**UNIT II HYDROLOGIC CYCLE AND FLOW NETS****9**

Flow nets – Graphical construction – Flow nets by numerical simulation. Steady state Regional Ground Water flow – steady state hydrologic budgets – Fluctuations in ground water levels – Case Studies.

**UNIT III RESOURCE EVALUATION****9**

Development of Ground Water resources – Exploration for Aquifers – the response of Ideal aquifers to pumping – Measurement of parameters – Laboratory tests – Piezometer test – Pumping tests – Estimation of saturates Hydraulic conductivity – Numerical simulation for aquifer yield prediction – Artificial recharge and induced infiltration – Land subsidence – Sea water intrusion – Case Studies.

**UNIT IV CHEMICAL PROPERTIES AND PRINCIPLES****9**

Constituents – Chemical equilibrium – Association and Dissociation of dissolved species – effects of concentration gradients – Mineral dissolution and solubility – Oxidation and reduction process – Ion exchange and Adsorption – Environmental isotopes – Field Measurement of Index parameters – Hydro chemical facies – Ground water in carbonate terrain – Ground Water in crystalline rocks – ground water in complex sedimentary systems – Geochemical interpretation of  $^{14}\text{C}$  Dates – Process rates and molecular diffusion.

**UNIT V SOLUTE TRANSPORT****9**

Transport process – non-reactive constituents in homogeneous media and Heterogeneous media – Transport in Fracture media – Hydro chemical behavior of contaminants – trace metals – Trace nonmetals – Nitrogen, organic substances – Measurement of parameters – Velocity – Dispersivity – chemical partitioning.

**REFERENCES:**

1. Randall J. Charbeneau, "Ground water Hydraulics and Pollutant transport " Prentice Hall, Upper Saddle.
2. Todd David Keith, Ground water Hydrology, second edition, John Wiley and sons New York, 1980.
3. Allen Freeze, R. and John A. Cherry, "Ground Water ", Prentice Hall, Inc. 1979.

|               |                                                                |          |          |          |          |
|---------------|----------------------------------------------------------------|----------|----------|----------|----------|
| <b>BCE074</b> | <b>PHYSICAL AND CHEMICAL TREATMENT OF WATER AND WASTEWATER</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|               | Total Contact Hours - 45                                       | 3        | 0        | 0        | 3        |

|                                                                                                                                          |          |                                                                                                                                                                                  |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
|------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
|                                                                                                                                          |          | Prerequisite – Environmental Engineering                                                                                                                                         |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                                          |          | Course Designed by – Dept of Civil Engineering                                                                                                                                   |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| <b>OBJECTIVES:</b>                                                                                                                       |          |                                                                                                                                                                                  |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| To educate the student on the working principles and design of various physical and chemical treatment systems for water and wastewater. |          |                                                                                                                                                                                  |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                             |          |                                                                                                                                                                                  |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO1                                                                                                                                      |          | To make them understand the fundamentals of waste water treatment .To learn about the various Pollutants in water and waste water and also to study about their characteristics. |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO2                                                                                                                                      |          | To understand about the methods of waste characterization , source reduction and to study the various methods of generation of wastes.                                           |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO3                                                                                                                                      |          | To understand in detail about the various principles of chemical treatment which include precipitation coagulation etc.                                                          |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO4                                                                                                                                      |          | To improve the knowledge on the Selection of unit operation and processes and to study the design oriented aspects of sand filters and other treatment processes.                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO5                                                                                                                                      |          | To know about the basics of the design of industrial waste water treatment and reclamation processes                                                                             |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low              |          |                                                                                                                                                                                  |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| 1                                                                                                                                        | COs/POs  | a                                                                                                                                                                                | b | c                           | d | e                  | f                      | g                  | h | i                       | j | k                  | l                                            |
| 2                                                                                                                                        | CO1      | H                                                                                                                                                                                |   |                             |   | M                  |                        |                    |   |                         | L |                    |                                              |
|                                                                                                                                          | CO2      |                                                                                                                                                                                  |   |                             | M |                    |                        | M                  |   | H                       |   |                    |                                              |
|                                                                                                                                          | CO3      | H                                                                                                                                                                                |   |                             |   |                    | H                      |                    |   |                         |   |                    |                                              |
|                                                                                                                                          | CO4      |                                                                                                                                                                                  |   |                             |   |                    |                        | H                  |   | L                       |   |                    |                                              |
|                                                                                                                                          | CO5      | H                                                                                                                                                                                | M |                             |   | H                  |                        | M                  |   |                         | L |                    |                                              |
| 3                                                                                                                                        | Category | Humanities & Social Studies (HS)                                                                                                                                                 |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                                          |          |                                                                                                                                                                                  |   |                             |   |                    |                        |                    |   | √                       |   |                    |                                              |
| 4                                                                                                                                        | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016                                                                                                                   |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |

## UNITI INTRODUCTION

9

Pollutant in water and wastewater – characteristics, standards for performance – significant and need for physic – chemical treatment.

## UNITII PHYSICAL TREATMENT PRINICIPLES

9

Principles of screening – mixing, equalizations –sedimentation – filtration –modeling – backwashing –evaporation-incineration- gas transfer-mass transfer coefficients. Adsorption-isotherms-principles, equilibrates and kinetics, reactors, regeneration, membrane separation, reverse osmosis, nano filtration ultra filtration and hyper filtration – electro dialysis, distillation – stripping and crystallization-recent advances.

**UNITIII CHEMICAL TREATMENT PRINCIPLES****9**

Principles of chemical treatment – coagulation flocculation – precipitation –floatation, solidification and stabilization- disinfection .ion exchange, electrolytic methods -Solvent extraction –advanced oxidation / reduction –recent advances.

**UNITIV DESIGN OF CONVENTIONAL TREATMENT PLANTS****9**

Selection of unit operation and processes – design of conventional water treatment plant units – aerators –chemical feeding –flocculation –clarifier – filters –rapid sand filter, slow sand filter, pressure filter-chlorinators. Displacement and gaseous type. layouts- flowcharts –hydraulic profile –O & M aspects- case studies , residue management – up gradation of existing plants – recent advances.

**UNITV DESIGN OF INDUSTRIAL WATER TREATMENT AND ECLAMATIO 9**

Selection of process –design of softeners – demineralisers –wastewater reclamation – reverse osmosis plants –residue management – O & M aspects –recent advances –case studies.

**REFERENCES:**

1. Metcalf and Eddy, Wastewater Engineering, Treatment and Reuse Tata McGraw-Hill, New Delhi, 2003.
2. Manual on water supply and Treatment CPHEEO, Ministry of Urban Development ,GOI, New Delhi,1999.
3. Lee ,CC and Shun dar Lin , Handbook of Environmental Engineering Calculations, McGraw-hill,Newyork , 1999.
4. Qasim,S.R motely, E.N., Zhu, G. Water Works Engineering – Planning, Design and Operation,Prentice Hall,New Delhi, 2002.
5. Casey, T.J.Unit Treatment Processes in Water and Wastewater Engineering, John Wiley and Sons, London1993.

|                                                                                                                             |                                                                                                                                                |          |          |          |          |
|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|----------|----------|
| <b>BCE075</b>                                                                                                               | <b>GROUND WATER ENGINEERING</b>                                                                                                                | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                                             | Total Contact Hours - 45                                                                                                                       | 3        | 0        | 0        | 3        |
|                                                                                                                             | Prerequisite – Irrigation Engineering                                                                                                          |          |          |          |          |
|                                                                                                                             | Course Designed by – Dept of Civil Engineering                                                                                                 |          |          |          |          |
| <b>OBJECTIVES:</b>                                                                                                          |                                                                                                                                                |          |          |          |          |
| 1. To introduce the student to the principles of Groundwater governing Equations and Characteristics of different aquifers, |                                                                                                                                                |          |          |          |          |
| 2. To understand the techniques of development and management of groundwater.                                               |                                                                                                                                                |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                |                                                                                                                                                |          |          |          |          |
| CO1                                                                                                                         | To learn about the basics of ground water Engineering including the hydrogeological cycle and water level fluctuations                         |          |          |          |          |
| CO2                                                                                                                         | To learn about the basics of hydrology of ground water and to make a clear understanding of ground water flow equations of velocity equations. |          |          |          |          |
| CO3                                                                                                                         | To study the basics of unsteady flow and various methods unsteady flow.                                                                        |          |          |          |          |
| CO4                                                                                                                         | To know about the various sources of ground water like collector wells, infiltration galleries.                                                |          |          |          |          |

|                                                                                                                             |                                                                                           |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
| CO5                                                                                                                         | To study about the ground water quality chemistry its origin and water quality standards. |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                           |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| 1                                                                                                                           | COs/POs                                                                                   | a                                                              | b | c                           | d | e                  | f                      | g                  | h | i                       | j | k                  | l                                            |
| 2                                                                                                                           | CO1                                                                                       | H                                                              |   |                             | M |                    |                        |                    |   |                         | L |                    |                                              |
|                                                                                                                             | CO2                                                                                       |                                                                |   |                             |   |                    | H                      |                    | L |                         |   | M                  |                                              |
|                                                                                                                             | CO3                                                                                       |                                                                |   |                             | H |                    |                        |                    |   | M                       |   |                    |                                              |
|                                                                                                                             | CO4                                                                                       |                                                                |   |                             |   |                    | M                      |                    |   | H                       | L |                    |                                              |
|                                                                                                                             | CO5                                                                                       |                                                                |   |                             |   | M                  |                        |                    |   |                         |   |                    | S                                            |
| 3                                                                                                                           | Category                                                                                  | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                             |                                                                                           |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                             |                                                                                           |                                                                |   |                             |   |                    |                        |                    |   | √                       |   |                    |                                              |
| 4                                                                                                                           | Approval                                                                                  | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |

## UNIT I FUNDAMENTALS OF GROUND WATER

9

Introduction – Characteristics of Ground water – Global distribution of water – ground water column- Permeability- Darcy's Law, laboratory permeability test Types of aquifers. Hydro geological Cycle, water level fluctuations.

## UNIT II HYDRAULICS OF FLOW

9

Storage coefficient, Specific yield, Heterogeneity and Anisotropy/Transmissivity – governing equations of ground water flow – Steady state flow – Dupuit/Forchheimer assumption. Velocity potential flow nets.

## UNIT III ESTIMATION OF PARAMETERS

9

Transmissivity and Storativity Pumping test - Unsteady state flow- Thies method- Jacob methods - Image well theory - Effect of partial penetrations of well – collectors wells.

## UNIT IV GROUND WATER DEVELOPMENT

9

Collector wells – infiltration gallery – Conjunctive use – Artificial recharge – Safe yield – Yield test – Geophysical method – Selection of pumps.

## UNIT V WATER QUALITY

9

Ground water chemistry – origin, movement and quality – water quality standards – salt water intrusion – Environmental concern.

### TEXT BOOKS:

1. Reghunath H.M. "Ground Water Hydrology", Wiley Eastern Ltd., Second reprint, 2000.

### REFERENCES:

1. Todd D.K., "Ground Water Hydrology", Johnand Sons, 2000.
2. Ramakrishnan S., "Ground Water Groundwater", Ramakrishnan Publication, Chennai 1998.
3. William C Walton, "Ground Water Resource Evaluation", McGraw Hill New York 1970.

|                                                                                                                                                                                                                         |                                                                                                                                                                                                   |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|---|----------------------------------------------|
| BCE076                                                                                                                                                                                                                  | COASTAL ENGINEERING                                                                                                                                                                               |                                                                |                             |   |                    |                        |                    |   | L                       | T | P                  | C |                                              |
|                                                                                                                                                                                                                         | Total Contact Hours - 45                                                                                                                                                                          |                                                                |                             |   |                    |                        |                    |   | 3                       | 0 | 0                  | 3 |                                              |
|                                                                                                                                                                                                                         | Prerequisite – Fluid Mechanics                                                                                                                                                                    |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |
|                                                                                                                                                                                                                         | Course Designed by – Dept of Civil Engineering                                                                                                                                                    |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |
| OBJECTIVES:                                                                                                                                                                                                             |                                                                                                                                                                                                   |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |
| 1. To provide an overview of the analysis and design procedures used in the field of coastal engineering.                                                                                                               |                                                                                                                                                                                                   |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |
| 2. To introduce the processes of including coastal and estuarine circulation, coastal and shelf waves, surf zone hydrodynamics, sediment transport, hurricane-induced storm surge and inundation, beach nourishment etc |                                                                                                                                                                                                   |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |
| 3. To enable students apply these engineering principles to solve the problems in this environment such as shoreline erosion, natural flooding hazards, water quality deterioration and coastal habitat evanescence.    |                                                                                                                                                                                                   |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |
| COURSE OUTCOMES (COs)                                                                                                                                                                                                   |                                                                                                                                                                                                   |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |
| CO1                                                                                                                                                                                                                     | To provide an overview of the fundamental principles of ocean science and technology.                                                                                                             |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |
| CO2                                                                                                                                                                                                                     | To provide the background needed to undertake coastal oceanographic investigations and sets them in context by incorporating case studies and sample problems based on local and global examples. |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |
| CO3                                                                                                                                                                                                                     | To facilitate students to work across disciplinary boundaries and develop an approach that will enable them to incorporate human society in their exploration and analysis of coastal areas.      |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |
| CO4                                                                                                                                                                                                                     | To be able to “see” the features and components of the natural, engineering and human aspects of the coast, the functions of components and relationship between them.                            |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |
| CO5                                                                                                                                                                                                                     | To provide students understanding of the materials and processes associated with the major natural natural and artificial harbours.                                                               |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                                                                             |                                                                                                                                                                                                   |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |
| 1                                                                                                                                                                                                                       | COs/POs                                                                                                                                                                                           | a                                                              | b                           | c | d                  | e                      | f                  | g | h                       | i | j                  | k | l                                            |
| 2                                                                                                                                                                                                                       | CO1                                                                                                                                                                                               | H                                                              |                             |   |                    |                        |                    |   |                         |   |                    |   | M                                            |
|                                                                                                                                                                                                                         | CO2                                                                                                                                                                                               | H                                                              |                             | M |                    |                        |                    |   |                         |   |                    |   | M                                            |
|                                                                                                                                                                                                                         | CO3                                                                                                                                                                                               | H                                                              |                             |   |                    |                        | H                  |   |                         |   | M                  |   | M                                            |
|                                                                                                                                                                                                                         | CO4                                                                                                                                                                                               | H                                                              |                             |   |                    |                        |                    |   |                         |   |                    |   | M                                            |
|                                                                                                                                                                                                                         | CO5                                                                                                                                                                                               | H                                                              |                             |   |                    |                        |                    |   |                         |   |                    |   | M                                            |
| 3                                                                                                                                                                                                                       | Category                                                                                                                                                                                          | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) |   | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                                                                                                                         |                                                                                                                                                                                                   |                                                                |                             |   |                    |                        |                    |   | √                       |   |                    |   |                                              |
| 4                                                                                                                                                                                                                       | Approval                                                                                                                                                                                          | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |   |                    |                        |                    |   |                         |   |                    |   |                                              |

## UNIT I WAVES GENERATION, PROPAGATION AND FORCE

9

Definition – Wave classification – Linear theory of waves- Assumptions and derivations of relationship of wave characteristics- Pressure within progressive wave- Wave energy - Fundamental aspects of stokes theory.

## **UNIT II      WAVE FORECASTING      9**

Need for forecasting – SMB and PNJ methods of wave forecasting.

## **UNIT III      TIDES      9**

Origin and classification of tides - Karwin's equilibrium theory of tides- Effects on structure - Seiches, surges and Tsunamis.

## **UNIT IV      SEDIMENT MOVEMENT      8**

Types of sediment movement – Types of beaches and beach profile – long shore drift and its engineering significance – Causes of coastal erosion and methods of protection.

## **UNIT V      HARBOURS      10**

Classification - types of their requirements – Requirements of modern port -Selection of site. BreakWater and their types of selection - Functional design of entrance Channel and breakwaters- Dredging - Need & types of selection of dredgers.

### **TEXT BOOKS:**

1. Garrison .T, “Oceanography”, Wadsworth Publications, 4th edition, 2002.

### **REFERENCES:**

1. Sorenson .R. M, “Coastal Zone Engineering”, Chapman & Hall, 3rd edition, 2006.
2. Wiegall. R.L., Oceanographical Engineering Prentice Haff, Englewood Cliff's, New Jersey, 1964.

### **NON MAJOR ELECTIVE-II**

|                                                                                                                                          |                                                                  |   |   |   |   |
|------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|---|---|---|---|
| BCE077                                                                                                                                   | FINITE ELEMENT ANALYSIS                                          | L | T | P | C |
|                                                                                                                                          | Total Contact Hours - 45                                         | 3 | 0 | 0 | 3 |
|                                                                                                                                          | Prerequisite – Structural Analysis – II                          |   |   |   |   |
|                                                                                                                                          | Course Designed by – Dept of Civil Engineering                   |   |   |   |   |
| <b>OBJECTIVES:</b><br>To study the energy principles, finite element concept, stress analysis, meshing, linear problems and applications |                                                                  |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                             |                                                                  |   |   |   |   |
| CO1                                                                                                                                      | To learn concepts of piecewise Approximation and Finite Elements |   |   |   |   |
| CO2                                                                                                                                      | To know about two dimensional problems in stress analysis.       |   |   |   |   |
| CO3                                                                                                                                      | To understand the meshing and solution problems                  |   |   |   |   |
| CO4                                                                                                                                      | To know about the nonlinear and vibration problems               |   |   |   |   |
| CO5                                                                                                                                      | To understand the Application to Thermal Analysis Problems.      |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low              |                                                                  |   |   |   |   |

|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
|---|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|----------------------------------------------|---|---|---|---|
| 1 | COs/POs  | a                                                              | b                           | c                  | d                      | e                  | f                       | g                  | h                                            | i | j | k | l |
| 2 | CO1      | H                                                              |                             |                    | H                      | H                  |                         |                    |                                              |   |   |   |   |
|   | CO2      | H                                                              |                             |                    | H                      | H                  |                         |                    |                                              |   |   |   |   |
|   | CO3      | H                                                              |                             |                    | H                      | H                  | M                       |                    |                                              |   |   |   |   |
|   | CO4      | H                                                              |                             |                    | H                      | H                  |                         |                    |                                              |   |   |   |   |
|   | CO5      | H                                                              |                             |                    | H                      | H                  |                         |                    |                                              |   |   |   | H |
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |   |   |   |
|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                              |   |   |   |   |

### UNIT I INTRODUCTION

10

Boundary Value problem – Approximate Solution - Variational and Weighted Residual Methods – Ritz and Galerkin Formulations – Concepts of piecewise Approximation and Finite Elements - Displacement and Shape Functions Weak formulation Minimum Potential Energy. Generation of Stiffness Matrix and Load Vector.

### UNIT II STRESS ANALYSIS

10

Two dimensional problems – Plane Stress, Plane Strain and Axisymmetric problems – Triangular and Quadrilateral Elements – Natural Coordinates – Isoparametric Formulation – Numerical Integration – Plate Bending and Shell Elements Brick elements for Fracture Analysis.

### UNIT III MESHING AND SOLUTION PROBLEMS

10

Higher Order Elements – P & H methods of refinement – III conditional Elements – Discretisation Errors – Auto and Adaptive Mesh Generation Techniques – Error Evaluation.

### UNIT IV NONLINEAR AND VIBRATION PROBLEMS

10

Material and Geometric Nonlinearity Methods of Treatment consistent System, Matrice Dynamic Condensation – Eigen Value Extraction.

### UNIT V THERMAL ANALYSIS

5

Application to Thermal Analysis Problems.

### REFERENCES :

1. Bathe, K.J. Finite Elements Procedures in Engineering analysis. Prentice Hall Inc., 1995.
2. Zienkiewicz, O.C. Arid Taylor, R.L. The Finite Elements Method, McGraw Hill, 1987.
3. Chandrupatla, R.T. and Belegunda. A.D, Introduction to Finite Elements in Engineering, 2<sup>nd</sup> Edition, Prentice Hall of India, 1997.
4. Moaveni.S., Finite Element Analysis: Theory and Application with ANSYS, Prentice Hall Inc., 1999.

|                                                                                                                       |                                                                                                                            |                                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|---|---------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|---|
| BCE078                                                                                                                | STUCTURES ON EXPANSIVE SOILS                                                                                               |                                                                |                             |   |               |                        |                    | L | T                       | P | C                  |                                              |   |
|                                                                                                                       | Total Contact Hours - 45                                                                                                   |                                                                |                             |   |               |                        |                    | 3 | 0                       | 0 | 3                  |                                              |   |
|                                                                                                                       | Prerequisite – Soil Mechanics                                                                                              |                                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
|                                                                                                                       | Course Designed by – Dept of Civil Engineering                                                                             |                                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| OBJECTIVES:                                                                                                           |                                                                                                                            |                                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| 1. To understand the dynamics of earth and to estimate dynamic properties of soils                                    |                                                                                                                            |                                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| 2. To develop the site specific design spectrum for design of sub structure and evaluation of liquefaction potential. |                                                                                                                            |                                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| 3. To design these structures in expansive soil                                                                       |                                                                                                                            |                                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| 4. To study the effectiveness of some supper structure resting on treated expansive soil                              |                                                                                                                            |                                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| 5. Factors influencing mechanisms in expansive soils                                                                  |                                                                                                                            |                                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| COURSE OUTCOMES (COs)                                                                                                 |                                                                                                                            |                                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| CO1                                                                                                                   | To understand the dynamics of earth and to estimate dynamic properties of soils                                            |                                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| CO2                                                                                                                   | To improve the engineering properties and make it suitable for construction                                                |                                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| CO3                                                                                                                   | The engineering properties, problems and solution need to be considered when constructing a foundation on expansive soils. |                                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| CO4                                                                                                                   | To develop the site specific design spectrum for design of sub structure and evaluation of liquefaction potential.         |                                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| CO5                                                                                                                   | To study the behaviour of the stabilized soil subjected to cyclic loading                                                  |                                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| Mapping of Course Outcomes with Program outcomes (POs)                                                                |                                                                                                                            |                                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                                     |                                                                                                                            |                                                                |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |
| 1                                                                                                                     | COs/POs                                                                                                                    | a                                                              | b                           | c | d             | e                      | f                  | g | h                       | i | j                  | k                                            | l |
| 2                                                                                                                     | CO1                                                                                                                        | H                                                              | M                           | L | H             | M                      |                    |   |                         |   |                    |                                              |   |
|                                                                                                                       | CO2                                                                                                                        | H                                                              | M                           | H | M             | M                      |                    |   |                         |   |                    |                                              |   |
|                                                                                                                       | CO3                                                                                                                        | M                                                              | M                           | L | H             | M                      |                    |   |                         |   |                    |                                              |   |
|                                                                                                                       | CO4                                                                                                                        | H                                                              | H                           | M | H             | M                      |                    |   |                         |   |                    |                                              |   |
|                                                                                                                       | CO5                                                                                                                        | M                                                              | M                           | M | H             | M                      |                    |   |                         |   |                    |                                              |   |
| 3                                                                                                                     | Category                                                                                                                   | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) |   | Engg Sciences | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |
|                                                                                                                       |                                                                                                                            |                                                                |                             |   |               |                        |                    |   | √                       |   |                    |                                              |   |
| 4                                                                                                                     | Approval                                                                                                                   | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |   |               |                        |                    |   |                         |   |                    |                                              |   |

## UNIT I GEOTECHNICAL PROBLEM

9

Occurrence and distribution - moisture equilibrium - Soil, structure, environmental interaction-distress symptoms - case histories.

## UNIT II EXPANSIVE SOIL PROPERTIES

9

Clay mineralogy - swell potential - field exploration - laboratory tests for identification.

## UNIT III SOIL HEAVING

9

Heave Prediction - Method of prediction of heave- Empirical methods - double of dometer tests - soil moisture suction - field observations, shrinkage.

#### UNIT IV DESIGN OF FOOTING

9

Foundation Design – Design consideration – individual and continuous footings- stiffened mats- underreamed piles- codal provisions.

#### UNIT V STABILIZATION

9

Stabilization methods

#### TEXT BOOKS:

1. John .D.N & Debora .J.M, “Expansive Soils Problems And Practice In Foundation & Pavement Engineering”, J. Wiley, 1992.

#### REFERENCES:

1. Satish Grower, The Architecture of India, Buddist, Hindu Period and Islamic PeriodVikas Publishing HousPvt Ltd., New Delhi, 1984.
2. Chen F.R,” Foundation on Expansive Soils”, Elseivier ,1973.
3. Parcher J.V & Means R.E, Soil Mechanics & Foundation, Columbus, 1968.
4. Perkk R.E., Hansen W.E, Thombum T.H, “Foundation Engineering”, John Wiley, 1974.
5. Kameswarao N.S.V,” Dynamic Soil Test & Applications”, Wheeler Publishing Co., 2002

|                                                                                                                             |                                                                                                                            |   |   |   |   |   |   |          |          |          |          |   |   |
|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|---|----------|----------|----------|----------|---|---|
| <b>BCE079</b>                                                                                                               | <b>STUCTURES ON EXPANSIVE SOILS</b>                                                                                        |   |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |
|                                                                                                                             | Total Contact Hours - 45                                                                                                   |   |   |   |   |   |   | 3        | 0        | 0        | 3        |   |   |
|                                                                                                                             | Prerequisite – Soil Mechanics                                                                                              |   |   |   |   |   |   |          |          |          |          |   |   |
|                                                                                                                             | Course Designed by – Dept of Civil Engineering                                                                             |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>OBJECTIVES:</b>                                                                                                          |                                                                                                                            |   |   |   |   |   |   |          |          |          |          |   |   |
| 1.To understand the dynamics of earth and to estimate dynamic properties of soils                                           |                                                                                                                            |   |   |   |   |   |   |          |          |          |          |   |   |
| 2.To develop the site specific design spectrum for design of sub structure and evaluation of liquefaction potential.        |                                                                                                                            |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                |                                                                                                                            |   |   |   |   |   |   |          |          |          |          |   |   |
| CO1                                                                                                                         | To understand the dynamics of earth and to estimate dynamic properties of soils                                            |   |   |   |   |   |   |          |          |          |          |   |   |
| CO2                                                                                                                         | To improve the engineering properties and make it suitable for construction                                                |   |   |   |   |   |   |          |          |          |          |   |   |
| CO3                                                                                                                         | The engineering properties, problems and solution need to be considered when constructing a foundation on expansive soils. |   |   |   |   |   |   |          |          |          |          |   |   |
| CO4                                                                                                                         | To develop the site specific design spectrum for design of sub structure and evaluation of liquefaction potential.         |   |   |   |   |   |   |          |          |          |          |   |   |
| CO5                                                                                                                         | To study the behaviour of the stabilized soil subjected to cyclic loading                                                  |   |   |   |   |   |   |          |          |          |          |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                                            |   |   |   |   |   |   |          |          |          |          |   |   |
| 1                                                                                                                           | COs/POs                                                                                                                    | a | b | c | d | e | f | g        | h        | i        | j        | k | l |
| 2                                                                                                                           | CO1                                                                                                                        | H | M | L | H | M |   |          |          |          |          |   |   |
|                                                                                                                             | CO2                                                                                                                        | H | M | H | M | M |   |          |          |          |          |   |   |
|                                                                                                                             | CO3                                                                                                                        | M | M | L | H | M |   |          |          |          |          |   |   |
|                                                                                                                             | CO4                                                                                                                        | H | H | M | H | M |   |          |          |          |          |   |   |

|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                              |  |  |  |  |
|---|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|----------------------------------------------|--|--|--|--|
|   | CO5      | M                                                              | M                           | M                  | H                      | M                  |                         |                    |                                              |  |  |  |  |
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |  |  |  |  |
|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                              |  |  |  |  |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                              |  |  |  |  |

### UNIT I GEOTECHNICAL PROBLEM

9

Occurrence and distribution - moisture equilibrium - Soil, structure, environmental interaction- distress symptoms - case histories.

### UNIT I EXPANSIVE SOIL PROPERTIES

9

Clay mineralogy - swell potential - field exploration - laboratory tests for identification.

### UNIT III SOIL HEAVING

9

Heave Prediction - Method of prediction of heave- Empirical methods - double of drometer tests - soil moisture suction - field observations, shrinkage.

### UNIT IV DESIGN OF FOOTING

9

Foundation Design – Design consideration – individual and continuous footings- stiffened mats- underreamed piles- codal provisions.

### UNIT V STABILIZATION

9

Stabilization methods

### TEXT BOOKS:

1. John .D.N & Debora .J.M, “Expansive Soils Problems And Practice In Foundation & Pavement Engineering”, J. Wiley, 1992.

### REFERENCES:

1. Satish Grower, The Architecture of India, Buddhist, Hindu Period and Islamic Period. Vikas Publishing Hous Pvt Ltd., New Delhi, 1984.
2. Chen F.R,” Foundation on Expansive Soils”, Elseivier ,1973.
3. Parcher J.V & Means R.E, Soil Mechanics & Foundation, Columbus, 1968.
4. Perkk R.E., Hansen W.E, Thombum T.H, “Foundation Engineering”, John Wiley, 1974.
5. Kameswarao N.S.V,” Dynamic Soil Test & Applications”, Wheeler Publishing Co., 2002

|                                                                                                                                     |                                                         |          |          |          |          |
|-------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|----------|----------|----------|----------|
| <b>BCE080</b>                                                                                                                       | <b>QUALITY CONTROL AND ASSURANCE IN CONSTRUCTION</b>    | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                                                     | Total Contact Hours - 45                                | 3        | 0        | 0        | 3        |
|                                                                                                                                     | Prerequisite – Building Construction                    |          |          |          |          |
|                                                                                                                                     | Course Designed by – Dept of Civil Engineering          |          |          |          |          |
| <b>OBJECTIVES:</b> To create a complete understanding on quality planning, quality assurance, quality control and safety management |                                                         |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                        |                                                         |          |          |          |          |
| CO1                                                                                                                                 | Know the Quality plan and Quality Management Guidelines |          |          |          |          |

|                                                                                                                             |                                                                                                                 |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
| CO2                                                                                                                         | Understand the Quality system and standard Documents and Quality related training                               |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO3                                                                                                                         | Know the quality planning, Contract and construction programming, Inspection procedures, Processes and products |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO4                                                                                                                         | Know the quality assurance, appraisals and quality control by reliability testing                               |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO5                                                                                                                         | Understand how the quality techniques can be improved.                                                          |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                                 |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| 1                                                                                                                           | COs/POs                                                                                                         | a                                                              | b | c                           | d | e                  | f                      | g                  | h | i                       | j | k                  | l                                            |
| 2                                                                                                                           | CO1                                                                                                             |                                                                |   |                             |   |                    | M                      | M                  | M |                         |   |                    |                                              |
|                                                                                                                             | CO2                                                                                                             |                                                                |   |                             |   |                    | M                      | M                  | M |                         |   |                    |                                              |
|                                                                                                                             | CO3                                                                                                             |                                                                |   |                             |   |                    | M                      | M                  | M |                         | L |                    |                                              |
|                                                                                                                             | CO4                                                                                                             |                                                                |   |                             |   |                    | M                      | M                  | M |                         |   |                    |                                              |
|                                                                                                                             | CO5                                                                                                             | L                                                              |   |                             |   |                    | M                      | M                  | M |                         |   |                    |                                              |
| 3                                                                                                                           | Category                                                                                                        | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                             |                                                                                                                 |                                                                |   |                             |   |                    |                        |                    |   | √                       |   |                    |                                              |
| 4                                                                                                                           | Approval                                                                                                        | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |

## UNIT I QUALITY MANAGEMENT

9

Introduction – Definitions and objectives – Factor influencing construction quality - Responsibilities and authority - Quality plan - Quality Management Guidelines – Quality circles.

## UNIT II QUALITY SYSTEMS

9

Introduction - Quality system standard – ISO 9000 family of standards – Requirements – Preparing Quality System Documents – Quality related training – Implementing a Quality system – Third party Certification.

## UNIT III QUALITY PLANNING

9

Quality Policy, Objectives and methods in Construction industry - Consumers satisfaction, Ergonomics - Time of Completion - Statistical tolerance – Taguchi's concept of quality – Codes and Standards – Documents – Contract and construction programming – Inspection procedures - Processes and products – Total QA / QC programme and cost implication.

## UNIT IV QUALITY ASSURANCE AND CONTROL

9

Objectives - Regularity agent, owner, design, contract and construction oriented objectives, methods - Techniques and needs of QA/QC - Different aspects of quality - Appraisals, Factors influencing construction quality - Critical, major failure aspects and failure mode analysis, - Stability methods and tools, optimum design - Reliability testing, reliability coefficient and reliability prediction.

## UNIT V QUALITY IMPROVEMENT TECHNIQUES

9

Selection of new materials -Influence of drawings, detailing, specification, standardization -Bid preparation -Construction activity, environmental safety, social and environmental factors -

Natural causes and speed of construction -Life cycle costing -Value engineering and value analysis.

#### REFERENCES:

1. James, J.O' Brian, Construction Inspection Handbook – Quality Assurance and Quality Control, Van Nostrand, New York, 1989.
2. Kwaku, A., Tena, Jose, M. Guevara, Fundamentals of Construction Management and Organisation, Reston Publishing Co., Inc., Virginia, 1985.
3. Juran Frank, J.M. and Gryna, F.M. Quality Planning and Analysis, Tata McGraw Hill, 1993
4. Hutchins.G, ISO 9000, Viva Books, New Delhi, 2000
5. Clarkson H. Oglesby, Productivity Improvement in Construction, McGraw-Hill, 1989.
6. John L. Ashford, The Management of Quality in Construction, E & F.N.Spon, New York, 1989.
7. Steven McCabe, Quality Improvement Techniques in Construction, Addison Wesley Longman Ltd, England. 1998.

|                                                                                                                             |                                                                                            |   |   |   |   |   |   |          |          |          |          |   |   |
|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---|---|---|---|---|---|----------|----------|----------|----------|---|---|
| <b>BCE081</b>                                                                                                               | <b>CONSTRUCTION PERSONNEL MANAGEMENT</b>                                                   |   |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |
|                                                                                                                             | Total Contact Hours - 45                                                                   |   |   |   |   |   |   | 3        | 0        | 0        | 3        |   |   |
|                                                                                                                             | Prerequisite – Personality Development                                                     |   |   |   |   |   |   |          |          |          |          |   |   |
|                                                                                                                             | Course Designed by – Dept of Civil Engineering                                             |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>OBJECTIVES:</b><br>To introduce the elements of human behaviour and their impact on construction personnel management    |                                                                                            |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                |                                                                                            |   |   |   |   |   |   |          |          |          |          |   |   |
| CO1                                                                                                                         | Know about the Manpower Planning and Organising                                            |   |   |   |   |   |   |          |          |          |          |   |   |
| CO2                                                                                                                         | Understand the Development and Operation of human resources                                |   |   |   |   |   |   |          |          |          |          |   |   |
| CO3                                                                                                                         | Understand the awareness on fundamentals of human behavior under varying stress conditions |   |   |   |   |   |   |          |          |          |          |   |   |
| CO4                                                                                                                         | Know the welfare measures and Laws related to welfare measures.                            |   |   |   |   |   |   |          |          |          |          |   |   |
| CO5                                                                                                                         | Understand Management and Development MethodsProductivity of Human resources.              |   |   |   |   |   |   |          |          |          |          |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                            |   |   |   |   |   |   |          |          |          |          |   |   |
| 1                                                                                                                           | COs/POs                                                                                    | a | b | c | d | e | f | g        | h        | i        | j        | k | l |
| 2                                                                                                                           | CO1                                                                                        |   |   |   |   |   | M |          | M        |          |          |   |   |
|                                                                                                                             | CO2                                                                                        |   |   |   |   |   | M |          | M        |          |          |   |   |
|                                                                                                                             | CO3                                                                                        |   |   |   |   |   | M |          | M        |          |          |   |   |
|                                                                                                                             | CO4                                                                                        |   |   |   |   |   | M |          | M        |          |          |   |   |
|                                                                                                                             | CO5                                                                                        |   |   |   |   |   | M |          | M        |          |          |   |   |



|                                                                                                                                                                                          |                                                                                                                                         |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
|                                                                                                                                                                                          |                                                                                                                                         | Prerequisite – Applied Hydraulic Engineering                   |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
|                                                                                                                                                                                          |                                                                                                                                         | Course Designed by – Dept of Civil Engineering                 |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| <b>OBJECTIVES:</b>                                                                                                                                                                       |                                                                                                                                         |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| To educate the students in detailed concepts related to water transmission mains, water distribution system, sewer networks and storm water drain, with emphasis on computer application |                                                                                                                                         |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                             |                                                                                                                                         |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO1                                                                                                                                                                                      | To make them understand the fundamentals of hydraulic engineering and the various fluid flow phenomenon                                 |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO2                                                                                                                                                                                      | To understand about the methods of water transmission and distribution and the economics related to water transmission                  |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO3                                                                                                                                                                                      | To understand in detail about the waste water collection and conveyance and also the maintenance of sewers and design of sewer outfalls |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO4                                                                                                                                                                                      | To improve the knowledge on the planning and estimation of storm water flow.                                                            |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| CO5                                                                                                                                                                                      | To know about the basics of the Case Studies and Computer applications for water transmission..                                         |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                                              |                                                                                                                                         |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| 1                                                                                                                                                                                        | COs/POs                                                                                                                                 | a                                                              | b | c                           | d | e                  | f                      | g                  | h | i                       | j | k                  | l                                            |
| 2                                                                                                                                                                                        | CO1                                                                                                                                     | H                                                              |   |                             |   |                    |                        |                    |   |                         | L |                    |                                              |
|                                                                                                                                                                                          | CO2                                                                                                                                     | H                                                              | M |                             | M |                    | H                      |                    |   |                         |   | L                  |                                              |
|                                                                                                                                                                                          | CO3                                                                                                                                     |                                                                | M |                             |   |                    |                        |                    | H |                         |   |                    |                                              |
|                                                                                                                                                                                          | CO4                                                                                                                                     | H                                                              |   |                             |   |                    | H                      |                    |   | L                       |   |                    |                                              |
|                                                                                                                                                                                          | CO5                                                                                                                                     |                                                                | M |                             | H |                    |                        |                    |   |                         |   |                    |                                              |
| 3                                                                                                                                                                                        | Category                                                                                                                                | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                                                                                          |                                                                                                                                         |                                                                |   |                             |   |                    |                        |                    |   | √                       |   |                    |                                              |
| 4                                                                                                                                                                                        | Approval                                                                                                                                | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |

## UNIT I PRINCIPLES OF HYDRAULICS

9

Fluid properties; fluid flow – continuity principle, energy principle and momentum principle; frictional head loss in free and pressure flow, major and minor head loss, formula for estimation of head loss – pumping of fluids – selection of pumps – Flow measurement.

## UNIT II WATER TRANSMISSION AND DISTRIBUTION

9

Planning factors – Water transmission main design – pipe material – economics – water hammer analysis; water distribution pipe networks - methods for analysis and optimization - Laying and maintenance, insitu lining – appurtenances – corrosion prevention – minimization of water losses – leak detection.

**UNIT III      WASTEWATER COLLECTION AND CONVEYANCE      9**

Planning factors – Design of sanitary sewer; partial flow in sewers, economics of sewer design; sewer appurtenances; material, construction, inspection and maintenance of sewers; Design of sewer outfalls-mixing conditions; conveyance of corrosive wastewaters.

**UNIT IV      STORM WATER DRAINAGE      9**

Planning – run-off estimation, rainfall data analysis, storm water drain design – rain water harvesting

**UNIT V      CASE STUDIES AND COMPUTER APPLICATIONS      9**

Computer applications for water transmission, water distribution and sewer design.

**REFERENCES:**

1. G.S.Bajwa, Practical Handbook on Public Health Engineering, Deep Publishers, Shimla, 2003.
2. “Manual on water supply and Treatment”, CPHEEO, Ministry of Urban Development, Gol, New Delhi, 1999.
3. “Manual on sewerage and Sewage Treatment”, CPHEEO, Ministry of Urban Development, Gol, New Delhi, 1993.
4. B.A. Hauser, Practical Hydraulics Handbook, Lewis Publishers, New York, 1991.

|                                                                                                                                                                                                                |                                                                                                                                        |   |   |   |   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|
| BCE083                                                                                                                                                                                                         | ENVIRONMENTAL ENGINEERING<br>STRUCTURES                                                                                                | L | T | P | C |
|                                                                                                                                                                                                                | Total Contact Hours - 45                                                                                                               | 3 | 0 | 0 | 3 |
|                                                                                                                                                                                                                | Prerequisite – Environmental Engineering                                                                                               |   |   |   |   |
|                                                                                                                                                                                                                | Course Designed by – Dept of Civil Engineering                                                                                         |   |   |   |   |
| <b>OBJECTIVES:</b><br>To educate the students in detailed concepts related to water transmission mains, water distribution system, sewer networks and storm water drain, with emphasis on computer application |                                                                                                                                        |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                                                   |                                                                                                                                        |   |   |   |   |
| CO1                                                                                                                                                                                                            | To make them understand the fundamentals of Structural design of Concrete, Prestressed Concrete, Steel and Cast iron etc               |   |   |   |   |
| CO2                                                                                                                                                                                                            | To understand about the methods of analysis and design of water tanks and the types of cement roofing system                           |   |   |   |   |
| CO3                                                                                                                                                                                                            | To understand in detail about the design of special purpose structures like underground reservoirs and swimming pools.                 |   |   |   |   |
| CO4                                                                                                                                                                                                            | To improve the knowledge on the repair and rehabilitation of structures and also diagnosing and identification of the cause and damage |   |   |   |   |
| CO5                                                                                                                                                                                                            | To know about the exposure on steel, lattice structures used in water and sewerage works.                                              |   |   |   |   |

| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |         |   |   |   |   |   |   |   |   |   |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------|---------|---|---|---|---|---|---|---|---|---|---|---|---|
| 1                                                                                                                           | COs/POs | a | b | c | d | e | f | g | h | i | j | k | l |

|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                              |  |   |  |  |
|---|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|----------------------------------------------|--|---|--|--|
| 2 | CO1      | H                                                              |                             |                    |                        |                    |                         |                    |                                              |  |   |  |  |
|   | CO2      | H                                                              |                             |                    | M                      |                    |                         |                    |                                              |  | L |  |  |
|   | CO3      | H                                                              | L                           |                    |                        |                    |                         |                    |                                              |  |   |  |  |
|   | CO4      |                                                                |                             |                    |                        |                    | H                       |                    |                                              |  | L |  |  |
|   | CO5      |                                                                | M                           |                    | H                      |                    |                         |                    |                                              |  |   |  |  |
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |  |   |  |  |
|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                              |  |   |  |  |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                              |  |   |  |  |

### **UNIT I DESIGN OF PIPES**

**9**

Structural design of a) Concrete b) Prestressed Concrete c) Steel and d) Castiron piping mains, sewerage tanks design - anchorage for pipes - massive outfalls - structural design and laying - hydrodynamic considerations. Advances in the manufacture of pipes.

### **UNIT II ANALYSIS AND DESIGN OF WATER TANKS**

**9**

Design of concrete roofing systems a) Cylindrical b) Spherical and c) Conical shapes using membrane theory and design of various types of folded plates for roofing with concrete. IS Codes for the design of water retaining structures. Design of circular, rectangular, spherical and Intze type of tanks using concrete. Design of prestressed concrete cylindrical tanks - Economic analysis - introduction to computer aided design and packages.

### **UNIT III DESIGN OF SPECIAL PURPOSE STRUCTURES**

**9**

Underground reservoirs and swimming pools, Intake towers, Structural design including foundation of water retaining structures such as settling tanks, clarifloculators, aeration tanks etc. - effect of earth pressure and uplift considerations - selection of materials of construction.

### **UNIT IV REPAIR AND REHABILITATION OF STRUCTURES**

**9**

Diagonising the cause and damage, identification of different types of structural and non-structural cracks - repair and rehabilitation methods for Masonry, Concrete and Steel Structures.

### **UNIT V EXPOSURE ON STEEL, LATTICE STRUCTURES USED IN WATER AND SEWERAGE WORKS**

**9**

#### **TEXT BOOKS:**

- 1.Reinforced Concrete by P .Dayaratnam.
- 2.Prestressed Concrete by Krishna Raju, Tata McGraw-ill Publishing Co. 2nd Edition 1988.
- 3.Reinforced Concrete by N.C.Sinha & S.K.Roy - S.Chand and Co. 1985.

#### **REFERENCES:**

- 1.Hulse R., and Mosley, W.H., "Reinforced Concrete Design by Computer", Macmillan Education Ltd., 1986.

2. Ramaswamy, G.S., "Design and Construction of Concrete shell roofs", CBS Publishers, India, 1986.
3. Green, J.K. and Perkins, P.H., "Concrete liquid retaining structures", Applied Science Publishers, 1981.

|                                                                                                                           |                                                                         |                                                                |   |                             |   |               |                        |                    |                         |   |                    |                                              |   |
|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|----------------------------------------------------------------|---|-----------------------------|---|---------------|------------------------|--------------------|-------------------------|---|--------------------|----------------------------------------------|---|
| BCE083                                                                                                                    | SOIL DYNAMICS & MACHINE FOUNDATION                                      |                                                                |   |                             |   |               |                        | L                  | T                       | P | C                  |                                              |   |
|                                                                                                                           | Total Contact Hours - 45                                                |                                                                |   |                             |   |               |                        | 3                  | 0                       | 0 | 3                  |                                              |   |
|                                                                                                                           | Prerequisite – Soil Mechanics                                           |                                                                |   |                             |   |               |                        |                    |                         |   |                    |                                              |   |
|                                                                                                                           | Course Designed by – Dept of Civil Engineering                          |                                                                |   |                             |   |               |                        |                    |                         |   |                    |                                              |   |
| OBJECTIVES:                                                                                                               |                                                                         |                                                                |   |                             |   |               |                        |                    |                         |   |                    |                                              |   |
| 1. To understand the soil properties and suitable remedial measures to improve their behavior.                            |                                                                         |                                                                |   |                             |   |               |                        |                    |                         |   |                    |                                              |   |
| 2. To familiarize students with the dynamic properties of soil.                                                           |                                                                         |                                                                |   |                             |   |               |                        |                    |                         |   |                    |                                              |   |
| 3. To create an understanding about the importance of designing machine foundation for reciprocating and impact machines. |                                                                         |                                                                |   |                             |   |               |                        |                    |                         |   |                    |                                              |   |
| COURSE OUTCOMES (COs)                                                                                                     |                                                                         |                                                                |   |                             |   |               |                        |                    |                         |   |                    |                                              |   |
| CO1                                                                                                                       | To understand the Vibration of elementary systems                       |                                                                |   |                             |   |               |                        |                    |                         |   |                    |                                              |   |
| CO2                                                                                                                       | To improve the engineering properties and application in soil dynamics. |                                                                |   |                             |   |               |                        |                    |                         |   |                    |                                              |   |
| CO3                                                                                                                       | The engineering dynamic properties of soil Field & Laboratory methods.  |                                                                |   |                             |   |               |                        |                    |                         |   |                    |                                              |   |
| CO4                                                                                                                       | To develop specific design Impact type machine and Rotary type machines |                                                                |   |                             |   |               |                        |                    |                         |   |                    |                                              |   |
| CO5                                                                                                                       | To study the principles of vibration neutralizer                        |                                                                |   |                             |   |               |                        |                    |                         |   |                    |                                              |   |
| Mapping of Course Outcomes with Program outcomes (POs)                                                                    |                                                                         |                                                                |   |                             |   |               |                        |                    |                         |   |                    |                                              |   |
| (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                                         |                                                                         |                                                                |   |                             |   |               |                        |                    |                         |   |                    |                                              |   |
| 1                                                                                                                         | COs/POs                                                                 | a                                                              | b | c                           | d | e             | f                      | g                  | h                       | i | j                  | k                                            | l |
| 2                                                                                                                         | CO1                                                                     | H                                                              | M | M                           | H | M             |                        | H                  |                         |   |                    |                                              |   |
|                                                                                                                           | CO2                                                                     | M                                                              | L | H                           | M | M             |                        | M                  |                         |   |                    |                                              |   |
|                                                                                                                           | CO3                                                                     | M                                                              | M | L                           | H | M             |                        | M                  |                         |   |                    |                                              |   |
|                                                                                                                           | CO4                                                                     | M                                                              | H | M                           | H | M             |                        | M                  |                         |   |                    |                                              |   |
|                                                                                                                           | CO5                                                                     | M                                                              | M | M                           | H | M             |                        | M                  |                         |   |                    |                                              |   |
| 3                                                                                                                         | Category                                                                | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |
|                                                                                                                           |                                                                         |                                                                |   |                             |   |               |                        |                    | √                       |   |                    |                                              |   |
| 4                                                                                                                         | Approval                                                                | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |               |                        |                    |                         |   |                    |                                              |   |

## UNIT I INTRODUCTION

8

Vibration of elementary systems – vibratory – single degree freedom -system – free and forced vibrations with and without damping – transient response of single degree freedom systems.

**UNIT II WAVES & WAVE PROPAGATION****9**

Wave propagation in an elastic homogeneous isotropic medium - Shear and compression waves - wave propagation in elastic, half space (no theoretical treatment or derivation) properties of compression, shear and Raleigh waves – application in soil dynamics.

**UNIT III DYNAMIC PROPERTIES OF SOILS****9**

Elastic properties of soils – soil treated as spring or elastic half space – Co – efficient – provision of dynamic properties of soil as per latest BIS 5249 -Co efficient of elastic, uniform and non-uniform compression and shear- Determination of dynamic properties of soil- Field & Laboratory methods.

**UNIT IV DESIGN OF MACHINE FOUNDATION****10**

General requirements of machine foundations – Design criteria – principles of & simple procedures of design of foundations for machineries of reciprocating type, Impact& Rotary type (treated as single degree freedom only) – dynamic loads, simple design procedures for foundations under Reciprocation machines. Impact type machine and Rotary type machines.

**UNIT V VIBRATION ISOLATION & SCREENING****9**

Vibration isolation technique mechanical isolation, foundation isolation, isolation by location isolation by barriers – active and passive isolation tests – problems – types of Isolation – active, passive – principles of vibration neutralizer (no derivation)

**TEXT BOOKS:**

1. Swamisaran, “Soil Dynamics and Machine Foundations”, Galgotia Publications Pvt. Ltd., 2010.

**REFERENCES BOOKS:**

1. Rtehart F.E, R.D.Woods & J.R. Hall, vibrations of Soils and Foundations, Prentice Hall, 1970.
2. Prakash S.& Pun V.K, Soil Dynamics & Design foundation, McGraw Hill Co. 1998.
3. Srinivasulli P &Vaidanathan C,” Handbook on machine Foundations”, McGraw Hill Co.1976.
4. Code Practice of Design and Construction of Machine Foundations, I.S.2974, 1987 Part I to IV.Prakash .S and Puri V.K, “Foundation for Machines”, McGraw Hill Publishing Company, Newyork, 1988

|                                                                                                                                                                                                       |                                                |          |          |          |          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|----------|----------|----------|----------|
| <b>BCE084</b>                                                                                                                                                                                         | <b>HYDROLOGY</b>                               | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                                                                                                                       | Total Contact Hours - 45                       | 3        | 0        | 0        | 3        |
|                                                                                                                                                                                                       | Prerequisite – Fluid Mechanics                 |          |          |          |          |
|                                                                                                                                                                                                       | Course Designed by – Dept of Civil Engineering |          |          |          |          |
| <b>OBJECTIVES:</b><br>To impart knowledge on hydrological cycle, spatial and temporal measurement and analysis of rainfall and their applications including flood routing and ground water hydrology. |                                                |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                                          |                                                |          |          |          |          |



|                                                                                                                                                                            |                                                                     |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|---|
| <b>OBJECTIVES:</b><br>To make the student to know about various bridge structures, selection of appropriate bridge structures and design it for the given site conditions. |                                                                     |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                               |                                                                     |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO1                                                                                                                                                                        | Design of through type and deck type steel highway bridges.         |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO2                                                                                                                                                                        | Design various type of plate girder and truss girder railway bridge |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO3                                                                                                                                                                        | Design various types of RC slab bridges for IRC loading             |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO4                                                                                                                                                                        | Design various types of RC girder bridges for IRC loading           |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO5                                                                                                                                                                        | Design prestressed concrete bridges                                 |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                                                |                                                                     |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| 1                                                                                                                                                                          | COs/POs                                                             | a                                                              | b                           | c | d                  | e                      | f                  | g | h                       | i | j                  | k                                            | l |
| 2                                                                                                                                                                          | CO1                                                                 |                                                                |                             | H | H                  |                        |                    |   |                         |   |                    |                                              |   |
|                                                                                                                                                                            | CO2                                                                 |                                                                |                             | H | H                  |                        |                    |   |                         |   |                    |                                              |   |
|                                                                                                                                                                            | CO3                                                                 |                                                                |                             | H | H                  |                        |                    |   |                         |   |                    |                                              |   |
|                                                                                                                                                                            | CO4                                                                 |                                                                |                             | H | H                  |                        |                    |   |                         |   |                    |                                              |   |
|                                                                                                                                                                            | CO5                                                                 |                                                                |                             | H | H                  |                        |                    |   |                         |   |                    |                                              |   |
| 3                                                                                                                                                                          | Category                                                            | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |
|                                                                                                                                                                            |                                                                     |                                                                |                             |   |                    |                        |                    |   | √                       |   |                    |                                              |   |
| 4                                                                                                                                                                          | Approval                                                            | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |

## UNIT I GENERAL

8

a. Types of concrete bridges, advantages, Limitation, Selection of site and Spacing of piers. B. I. R.C. code provisions, loading standards impact load theories of load distribution for Bridges, decks – Usage of Charts and curves for deck slab design.

## UNIT II R.C. GIRDER BRIDGES

9

T. Beam and slab bridges, Balanced Cantilever bridges: Advantages – General proportions for spans, Impact factor – Design of main girder and articulation.

## UNIT III BOX CULVERTS AND CONTINUOUS BEAMS

8

Design of single, multiple vent box Culverts – Moment distribution method - Design of continuous beams.

## UNIT IV PRE – STRESSED CONCRETE BRIDGES

12

Advantages – Examples of pre-stressed concrete Bridges - types – Design principles – Simply supported bridges.

## UNIT V BEARING AND SUBSTRUCTURES

8

Types of bearings, design of bearings for girder bridges- Types bridge substructure - Piers abutments, shallow and deep foundations - General arrangements.

**TEXT BOOKS:**

1. Ratwani NM, Vazirani VN , “Design of Concrete Bridge”, Khanna Publishers, New Delhi, 1975

**REFERENCES:**

1. Johnson Victor W, ”Essentials of Bridge Engineering”, Oxford IBH Publishing Co, New Delhi, 1980
2. Dr Krishnamorthy, "Introduction to Bridges", Two Editions, 1959, 1963
3. Jain OP and Jaikrishna, ”Plain and reinforced Concrete Vol.2”, Nemchand and bros, Roorkee, 1958
4. Rowe, R.E. “Concrete Bridges Design”, John Wiley & Sons, Inc, New York, 1962
5. [Jacques Ramsay Robinson](#), ”Piers, Abutments and Formwork for Bridges”, C. Lockwood, 1964

|                                                                   |          |                                                                                     |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
|-------------------------------------------------------------------|----------|-------------------------------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|---|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
| BCE086                                                            |          | MAINTENANC AND REHABILITATION OF STRUCTURES                                         |   |                             |   |                    |                        |   | L                  | T | P                       | C |                    |                                              |
|                                                                   |          | Total Contact Hours - 45                                                            |   |                             |   |                    |                        |   | 3                  | 0 | 0                       | 3 |                    |                                              |
|                                                                   |          | Prerequisite – Building Construction                                                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
|                                                                   |          | Course Designed by – Dept of Civil Engineering                                      |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| OBJECTIVES:                                                       |          |                                                                                     |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 1.To study the damages, repair and rehabilitation of structures   |          |                                                                                     |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| COURSE OUTCOMES (COs)                                             |          |                                                                                     |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO1                                                               |          | To learn about general consideration in quality assurance, structural appraisal etc |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO2                                                               |          | To know about techniques for repair in building cracks                              |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO3                                                               |          | To understand the reason for ineffective DPC and remedial treatments                |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO4                                                               |          | To know about types, causes for deterioration and preventive measures               |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| CO5                                                               |          | To learn the concepts of strengthening of existing structures                       |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)            |          |                                                                                     |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                                     |   |                             |   |                    |                        |   |                    |   |                         |   |                    |                                              |
| 1                                                                 | COs/POs  | a                                                                                   | b | c                           | d | e                  | f                      | g | h                  | i | j                       | k | l                  |                                              |
| 2                                                                 | CO1      | H                                                                                   |   | H                           |   | M                  |                        | H |                    |   |                         |   |                    |                                              |
|                                                                   | CO2      | H                                                                                   |   | H                           |   | H                  |                        |   |                    |   |                         |   |                    |                                              |
|                                                                   | CO3      | H                                                                                   | M | H                           |   | M                  | H                      |   |                    |   |                         |   |                    |                                              |
|                                                                   | CO4      | H                                                                                   |   | H                           | H | H                  |                        |   |                    |   |                         |   |                    |                                              |
|                                                                   | CO5      | H                                                                                   |   | H                           |   | H                  |                        |   |                    |   |                         |   |                    |                                              |
| 3                                                                 | Category | Humanities & Social Studies (HS)                                                    |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                   |          |                                                                                     |   |                             |   |                    |                        |   |                    |   | √                       |   |                    |                                              |

|   |          |                                                                |
|---|----------|----------------------------------------------------------------|
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |
|---|----------|----------------------------------------------------------------|

## **UNIT I INTRODUCTION 9**

General Consideration – Distresses monitoring – Causes of distresses – Quality assurance – Defects due to climate, chemicals, wear and erosion – Inspection – Structural appraisal – Economic appraisal.

## **UNIT II BUILDING CRACKS 9**

Causes – diagnosis – remedial measures – Thermal and Shrinkage cracks – unequal loading – Vegetation and trees – Chemical action – Foundation movements – Techniques for repair – Epoxy injection.

## **UNIT III MOISTURE PENETRATION 9**

Sources of dampness – Moisture movement from ground – Reasons for ineffective DPC – Roof leakage – Pitched roofs – Madras Terrace roofs – Leakage of Concrete slabs – Dampness in solid walls – condensation – hygroscopic salts – remedial treatments – Ferro cement overlay – Chemical coatings – Flexible and rigid coatings.

## **UNIT IV DISTRESSES AND REMEDIES 9**

Concrete Structures: Introduction – Causes of deterioration – Diagnosis of causes – Flow charts for diagnosis – methods of repair – repairing, spalling and disintegration – Repairing of concrete floors and pavements. Steel Structures : Types and causes for deterioration – preventive measures – Repair procedure – Brittle fracture – Lamellar tearing – Defects in welded joints – Mechanism of corrosion – Design of protect against corrosion – Design and fabrication errors – Distress during erection. Masonry Structures: Discoloration and weakening of stones – Biotical treatments – Preservation – Chemical preservatives – Brick masonry structures – Distresses and remedial measures.

## **UNIT V STRENGTHENING OF EXISTING STRUCTURES 9**

General principle – relieving loads – Strengthening super structures – plating – Conversion to composite construction – post stressing – Jacketing – bonded overlays – Reinforcement addition – strengthening the substructures – under pinning – Increasing the load capacity of footing – Design for rehabilitation.

### **REFERENCES:**

1. Allen R.T and Edwards S.C, “Repair of Concrete Structures”, Blakie and Sons, UK, 1987
2. Dayaratnam.P and Rao.R, “Maintenance and Durability of Concrete Structures”, University Press, India, 1997.
3. Denison Campbell, Allen and Harold Roper, “Concrete Structures, Materials, Maintenance and Repair”, Longman Scientific and Technical, UK, 1991.
4. Dodge Woodson.R, “Concrete Structures – protection, repair and rehabilitation”, Elsevier Butterworth – Heinmann, UK, 2009.
5. Peter H.Emmons, “Concrete Repair and Maintenance Illustrated”, Galgotia Publications Pvt. Ltd., 2001.
6. Raikar, R.N., “Learning from failures - Deficiencies in Design, Construction and Service” – Rand D Centre (SDCPL), Raikar Bhavan, Bombay, 1987.

|                                                                                                                             |                                                                                |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|---|
| BCE087                                                                                                                      | PROJECT FORMULATIONS AND APPRAISAL                                             |                                                                |                             |   |                    |                        |                    |   |                         | L | T                  | P                                            | C |
|                                                                                                                             | Total Contact Hours - 45                                                       |                                                                |                             |   |                    |                        |                    |   |                         | 3 | 0                  | 0                                            | 3 |
|                                                                                                                             | Prerequisite – Estimation & Costing                                            |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
|                                                                                                                             | Course Designed by – Dept of Civil Engineering                                 |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| OBJECTIVES:                                                                                                                 |                                                                                |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| 1. To introduce and study formulation, costing, appraisal and finance of construction projects.                             |                                                                                |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| COURSE OUTCOMES (COs)                                                                                                       |                                                                                |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO1                                                                                                                         | Formulate and generate the project and prepare reports for executing the work  |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO2                                                                                                                         | Understand the costing and cash flows of a project.                            |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO3                                                                                                                         | Assess various methods of project appraisal.                                   |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO4                                                                                                                         | Understand the project financing and special schemes.                          |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| CO5                                                                                                                         | Know about private sector participation in Infrastructure Development Projects |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                |                                                                |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |
| 1                                                                                                                           | COs/POs                                                                        | a                                                              | b                           | c | d                  | e                      | f                  | g | h                       | i | j                  | k                                            | l |
| 2                                                                                                                           | CO1                                                                            | M                                                              |                             |   |                    | H                      | M                  |   | M                       |   |                    |                                              |   |
|                                                                                                                             | CO2                                                                            | M                                                              |                             |   |                    | H                      | M                  |   | M                       |   | L                  |                                              |   |
|                                                                                                                             | CO3                                                                            | M                                                              |                             |   |                    | H                      | M                  |   | M                       |   |                    |                                              |   |
|                                                                                                                             | CO4                                                                            | M                                                              |                             |   |                    | H                      | M                  |   | M                       |   |                    |                                              |   |
|                                                                                                                             | CO5                                                                            | M                                                              |                             |   |                    | H                      | M                  |   | M                       |   |                    |                                              |   |
| 3                                                                                                                           | Category                                                                       | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |
|                                                                                                                             |                                                                                |                                                                |                             |   |                    |                        |                    |   | √                       |   |                    |                                              |   |
| 4                                                                                                                           | Approval                                                                       | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |   |                    |                        |                    |   |                         |   |                    |                                              |   |

### UNIT I PROJECT FORMULATION

10

Project – Concepts – Capital investments - Generation and Screening of Project Ideas - Project identification – Preliminary Analysis, Market, Technical, Financial, Economic and Ecological - Pre-Feasibility Report and its Clearance, Project Estimates and Techno-Economic Feasibility Report, Detailed Project Report – Different Project Clearances required.

### UNIT II PROJECT COSTING

10

Project Cash Flows – Time Value of Money – Cost of Capital.

### UNIT III PROJECT APPRAISAL

15

NPV – BCR – IRR – ARR – Urgency – Pay Back Period – Assessment of Various Methods – Indian Practice of Investment Appraisal – International Practice of Appraisal – Analysis of Risk – Different Methods – Selection of a Project and Risk Analysis in Practice.

**UNIT IV PROJECT FINANCING****5**

Project Financing – Means of Finance – Financial Institutions – Special Schemes – Key Financial Indicators – Ratios.

**UNIT V PRIVATE SECTOR PARTICIPATION****5**

Private sector participation in Infrastructure Development Projects - BOT, BOLT, BOOT - Technology Transfer and Foreign Collaboration - Scope of Technology Transfer.

**REFERENCES:**

1. Prasanna Chandra, Projects – Planning, Analysis, Selection, Implementation Review, Tata McGraw Hill Publishing Company Ltd., New Delhi. 2006.
2. Joy P.K., Total Project Management - The Indian Context, New Delhi, Macmillan India Ltd., 1992
3. United Nations Industrial Development Organisation (UNIDO) Manual for the Preparation of Industrial Feasibility Studies, (IDBI Reproduction) Bombay, 1987
4. Barcus, S.W. and Wilkinson.J.W., Hand Book of Management Consulting Services, McGraw Hill, New York, 1986.

|                                                                                                                                              |                                                                                                                          |   |   |   |   |
|----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|---|---|---|---|
| BCE088                                                                                                                                       | GIS IN CONSTRUCTION ENGINEERING AND MANAGEMENT                                                                           | L | T | P | C |
|                                                                                                                                              | Total Contact Hours - 45                                                                                                 | 3 | 0 | 0 | 3 |
|                                                                                                                                              | Prerequisite – Surveying I                                                                                               |   |   |   |   |
|                                                                                                                                              | Course Designed by – Dept of Civil Engineering                                                                           |   |   |   |   |
| <b>OBJECTIVES:</b><br>To introduce the elements of GIS as applied to construction management and achieve awareness on application techniques |                                                                                                                          |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                 |                                                                                                                          |   |   |   |   |
| CO1                                                                                                                                          | Know the characteristics of map and map projections.                                                                     |   |   |   |   |
| CO2                                                                                                                                          | Understand the various types of data, data analysis methods and data quality requirements                                |   |   |   |   |
| CO3                                                                                                                                          | Know the concepts of raster and vector data structure and applications of DEM.                                           |   |   |   |   |
| CO4                                                                                                                                          | Know the Measurement, Buffering, Overlaying and Components of data quality.                                              |   |   |   |   |
| CO5                                                                                                                                          | Understand means of getting suitable data output and to use the data output for construction management using GIS tools. |   |   |   |   |

**UNIT I GEOGRAPHIC INFORMATION SYSTEM****9**

GIS - Definition - Components of GIS -Maps - Definition - Types of Maps - Characteristics of Maps - Map Projections -- Hardware, Software and Organizational Context - GIS software

**UNIT II SPATIAL DATA****9**

Data Types - Spatial and Non-Spatial - Spatial Data - Points, Lines and areas- Non-spatial data - Nominal, Ordinal, Interval and Ratio - Digitizer - Scanner - Editing and Cleaning - Geo reference data

**UNIT III DATA STRUCTURE****9**

Raster and Vector Data Structure - Raster data storage - Run length, Chain and Block Coding - Vector Data Storage - Topology - Topological Models - Arc Node Structure - Surface Data - DEM - Grid DEM and TIN structure- Applications of DEM

**UNIT IV SPATIAL ANALYSIS****9**

Reclassification - Measurement - Buffering - Overlaying - SQL for Queries - Neighbourhood and zonal operations - Data Quality - Components of data quality - Sources of errors in GIS - Meta data

**UNIT V GIS APPLICATION****9**

Output - Maps, Graphs, Charts, Plots , Reports - Printers - Plotters - Fields of application - Natural Resource Management, construction management-Parcel based, AM/FM applications examples - Case study

**REFERENCES**

1. Burrough P.A., Principles of GIS for Land Resources Assessment, Oxford Publication, 1998
2. Robert Laurini and Derek Thompson, Fundamentals of Spatial Information Systems, Academic Press, 1996
3. Anji Reddy, Remote Sensing and Geographical Information Systems , BS Publications 2001
4. Srinivas M.G. (Edited by), Remote Sensing Applications, Narosa Publishing House, 2001
5. Rhind, D., Understanding of GIS, The ARC / INFO Method, ESRI Press. 1990

|                                                                                                                                                               |                                                                                                                                                      |          |          |          |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|----------|----------|
| <b>BCE089</b>                                                                                                                                                 | <b>ENVIRONMENTAL QUALITY MODELLING</b>                                                                                                               | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                                                                               | Total Contact Hours - 45                                                                                                                             | 3        | 0        | 0        | 3        |
|                                                                                                                                                               | Prerequisite – Environmental Engineering                                                                                                             |          |          |          |          |
|                                                                                                                                                               | Course Designed by – Dept of Civil Engineering                                                                                                       |          |          |          |          |
| <b>OBJECTIVES:</b><br>To educate the students on the basic principles,development and application of air and water quality models with computer applications. |                                                                                                                                                      |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                  |                                                                                                                                                      |          |          |          |          |
| CO1                                                                                                                                                           | To make them understand the fundamentals of mathematical Modeling and explain how modeling can be used as a tool in assessing environmental quality. |          |          |          |          |
| CO2                                                                                                                                                           | To understand about the methods of application of these models in simulation, parameter estimation and experimental design                           |          |          |          |          |
| CO3                                                                                                                                                           | To understand in detail about the water quality modeling process ,dissolved oxygen models and models on Groundwater                                  |          |          |          |          |
| CO4                                                                                                                                                           | To improve the knowledge on the emerging trends of air pollution modeling and prediction, performance and its utilization.                           |          |          |          |          |
| CO5                                                                                                                                                           | To know about the various case studies on air quality modeling and water quality modeling and other software package applications.                   |          |          |          |          |

| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
|-----------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
| 1                                                                                                                           | COs/POs  | a                                                              | b | c                           | d | e                  | f                      | g                  | h | i                       | j | k                  | l                                            |
| 2                                                                                                                           | CO1      | H                                                              |   |                             |   |                    |                        |                    |   |                         | L |                    |                                              |
|                                                                                                                             | CO2      |                                                                | M |                             | H |                    | H                      |                    |   |                         |   |                    |                                              |
|                                                                                                                             | CO3      | H                                                              |   | H                           |   |                    | M                      |                    |   | H                       |   |                    |                                              |
|                                                                                                                             | CO4      |                                                                |   |                             | M |                    |                        |                    |   | H                       |   |                    |                                              |
|                                                                                                                             | CO5      | H                                                              | M |                             |   | H                  |                        |                    |   |                         |   |                    |                                              |
| 3                                                                                                                           | Category | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                             |          |                                                                |   |                             |   |                    |                        |                    |   | √                       |   |                    |                                              |
| 4                                                                                                                           | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |

## UNIT I INTRODUCTION

9

Basics of mathematical Modeling- Modeling as a tool. Procedures of model development. Importance of model building. Characteristics of deterministic models. Classical approach to constrained and unconstrained optimization. State of the art in environmental engineering systems models-climate and system modeling-Erosion and sediment transport.

## UNIT II COMPUTER BASED SOLUTIONS

9

Formulation of linear optimization models. Linear programming. Sensitivity testing and duality. Solution techniques and computer programming; Formulation of linear optimization models. Application of models-simulation, parameter estimation and experimental design.

## UNIT III WATER QUALITY MODELLING

9

Rivers and streams water quality modeling-river hydrology and flow-low flow analysis-dispersion and mixing-flow, depth; water quality modeling process-model sensitivity-assessing model performance; Models for dissolved oxygen, pathogens; Groundwater modeling.

## UNIT IV AIR QUALITY MODELLING

9

Air pollution modeling and prediction, modeling technique, modeling for non reactive pollutants, single source short term impact; multiple sources and area sources, model performance, accuracy and utilization.

## UNIT V CASE STUDIES

9

Software package applications: Air quality modeling and water quality modeling.

## REFERENCES:

1. John Wainwright and Mark Mulligan, Environmental Modelling Finding Simplicity in Complexity, John Wiley and sons Ltd, USA, 2004
2. Dynamic Modeling of Environmental Systems by Deaton and Wine brake, Wiley & Sons, 2002.
3. Steven C. Chapra, Surface water quality modeling, McGraw-Hill Inc., New York, 1997.

4. Boubel R.W., Fox, D.L., Turner D.B.& Stern, A C. "Fundamentals of Air Pollution, Academic Press, New York,1994.

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|------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|----------|--------------------|----------------------------------------------|---|
| <b>BCE090</b>                                                                                                                                  | <b>MARINE POLLUTION MONITORING</b>                                                                                                                |                                                                |                             |   |                    |                        |                    |   | <b>L</b>                | <b>T</b> | <b>P</b>           | <b>C</b>                                     |   |
|                                                                                                                                                | Total Contact Hours - 45                                                                                                                          |                                                                |                             |   |                    |                        |                    |   | 3                       | 0        | 0                  | 3                                            |   |
|                                                                                                                                                | Prerequisite – Applied Hydraulic Engineering                                                                                                      |                                                                |                             |   |                    |                        |                    |   |                         |          |                    |                                              |   |
|                                                                                                                                                | Course Designed by – Dept of Civil Engineering                                                                                                    |                                                                |                             |   |                    |                        |                    |   |                         |          |                    |                                              |   |
| <b>OBJECTIVES:</b> To educate the students on aspects of marine pollution and methods of water quality assessment and marine pollution control |                                                                                                                                                   |                                                                |                             |   |                    |                        |                    |   |                         |          |                    |                                              |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                   |                                                                                                                                                   |                                                                |                             |   |                    |                        |                    |   |                         |          |                    |                                              |   |
| CO1                                                                                                                                            | To make them understand the fundamentals of General features of oceans and principles of marine geology                                           |                                                                |                             |   |                    |                        |                    |   |                         |          |                    |                                              |   |
| CO2                                                                                                                                            | To understand about the Living resources in and around the oceans                                                                                 |                                                                |                             |   |                    |                        |                    |   |                         |          |                    |                                              |   |
| CO3                                                                                                                                            | To understand in detail about the planning and preparation of marine Surveying and sea surveying which includes the oceanographic instrumentation |                                                                |                             |   |                    |                        |                    |   |                         |          |                    |                                              |   |
| CO4                                                                                                                                            | To improve the knowledge on the emerging trends of marine pollution applications of remote sensing and GIS in marine studies.                     |                                                                |                             |   |                    |                        |                    |   |                         |          |                    |                                              |   |
| CO5                                                                                                                                            | To know about the control strategies of marine pollution associated with sustainable development                                                  |                                                                |                             |   |                    |                        |                    |   |                         |          |                    |                                              |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                    |                                                                                                                                                   |                                                                |                             |   |                    |                        |                    |   |                         |          |                    |                                              |   |
| 1                                                                                                                                              | COs/POs                                                                                                                                           | a                                                              | b                           | c | d                  | e                      | f                  | g | h                       | i        | j                  | k                                            | l |
| 2                                                                                                                                              | CO1                                                                                                                                               | H                                                              |                             |   |                    |                        |                    | M |                         |          |                    |                                              |   |
|                                                                                                                                                | CO2                                                                                                                                               |                                                                |                             |   | M                  |                        | H                  |   |                         |          |                    |                                              |   |
|                                                                                                                                                | CO3                                                                                                                                               | H                                                              |                             |   |                    |                        |                    | M |                         |          | H                  |                                              |   |
|                                                                                                                                                | CO4                                                                                                                                               |                                                                |                             |   |                    |                        | H                  |   |                         | L        |                    |                                              |   |
|                                                                                                                                                | CO5                                                                                                                                               |                                                                | M                           |   |                    |                        | H                  |   |                         |          |                    |                                              |   |
| 3                                                                                                                                              | Category                                                                                                                                          | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |          | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |
|                                                                                                                                                |                                                                                                                                                   |                                                                |                             |   |                    |                        |                    |   | √                       |          |                    |                                              |   |
| 4                                                                                                                                              | Approval                                                                                                                                          | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |   |                    |                        |                    |   |                         |          |                    |                                              |   |

## UNIT I OCEANOGRAPHY

9

General features of ocean- Conservation laws- Wave characteristics and theories- Sediment transport- Tides- ocean Currents- Thermocline circulation- General circulation of ocean waters, Tsunamis, Storm Surge- Principles of Marine geology

## UNIT II COASTAL ENVIRONMENT

9

Living resources- coral reefs, mangroves, seagrass, seaweeds, fishery potential- nonliving resources- manganese nodules, heavy minerals- Beaches, Estuaries, Lagoons- Shoreline changes

## UNIT III MARINE SURVEYING

9

Sea surveying planning and preparation- Oceanographic instrumentation- Hydrographic Surveying- Underwater surveying- Measurement of physical properties of ocean water- sea bed sampling

#### **UNIT IV MARINE POLLUTION AND MONITORING**

**9**

Physiochemical properties of sea water- Sources of marine pollution and impacts on coastal ecosystems, Oil pollution- oil spill detection, dispersion, impacts on adjacent area- Oil spill modeling, mitigation measures- Oil exploration and their effects- Marine outfalls- Impacts of Ports and Harbour on marine water quality- dredging- Human intervention in estuarine ecosystem- sea water classification- Physical modeling in Coastal Engineering-Ocean monitoring satellites- Applications of Remote sensing and GIS in marine studies

#### **UNIT V MARINE POLLUTION CONTROL**

**9**

National and International treaties, protocols in marine pollution- Exclusive Economic Zone- Sustainable development.

#### **REFERENCES:**

- 1.Kennish, M.J., Pollution impacts on Marine Biotic Communities, CRC press New York,1998.
- 2.Newman, M.C., Roberts Jr. M.H., Male R.C.(Editors), Coastal and Estuarine Risk Assessment, Lewis Publishers, Washington,D.C.,2002.
- 3.U.S. Army Corps of Engineers, Shore protection Manual, Washington D.C.,2002.

| <b>BCE091</b>                                                                                                                                                                                                                                                                                                                                                                                          | <b>OPERATION &amp; MANAGEMENT OF IRRIGATION SYSTEMS</b>                                                                                                                        | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|----------|----------|
|                                                                                                                                                                                                                                                                                                                                                                                                        | Total Contact Hours - 45                                                                                                                                                       | 3        | 0        | 0        | 3        |
|                                                                                                                                                                                                                                                                                                                                                                                                        | Prerequisite – Irrigation Engineering- II                                                                                                                                      |          |          |          |          |
|                                                                                                                                                                                                                                                                                                                                                                                                        | Course Designed by – Dept of Civil Engineering                                                                                                                                 |          |          |          |          |
| <b>OBJECTIVES:</b>                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                |          |          |          |          |
| 1. To enable the students for a successful career as water management professionals. To create a potential among students in the area of irrigation management with specific enrichment to synthesis of data and their analysis.<br>2. To expose the students the need for an interdisciplinary approach in irrigation water management and providing a platform to work in an interdisciplinary team. |                                                                                                                                                                                |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                |          |          |          |          |
| CO1                                                                                                                                                                                                                                                                                                                                                                                                    | Understand the concepts of soil-water-plant relationship as well as to expose them to the principles and practices of crop production.                                         |          |          |          |          |
| CO2                                                                                                                                                                                                                                                                                                                                                                                                    | Exposure to ground water, hydraulics of ground water related to drainage, drainage concepts, planning, design and management of drainage related irrigation system management  |          |          |          |          |
| CO3                                                                                                                                                                                                                                                                                                                                                                                                    | The students will be able to understand an irrigation system, its components, its performance, and management of irrigation complexities to tackle different issues.           |          |          |          |          |
| CO4                                                                                                                                                                                                                                                                                                                                                                                                    | Understand the various principles of irrigation management and to analyse the different types of irrigation systems and their performances based on service oriented approach. |          |          |          |          |

|                                                                                                                             |          |                                                                                                                                                                          |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
|-----------------------------------------------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
| CO5                                                                                                                         |          | The students will acquire knowledge about the need for participatory approach and irrigation management transfer along with irrigation policy and institutional aspects. |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |          |                                                                                                                                                                          |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |
| 1                                                                                                                           | COs/POs  | a                                                                                                                                                                        | b | c                           | d | e                  | f                      | g                  | h | i                       | j | K                  | l                                            |
| 2                                                                                                                           | CO1      | H                                                                                                                                                                        | M | L                           | H | H                  |                        |                    |   |                         |   |                    | H                                            |
|                                                                                                                             | CO2      | H                                                                                                                                                                        | M | L                           | H | H                  |                        |                    |   |                         |   |                    | H                                            |
|                                                                                                                             | CO3      | H                                                                                                                                                                        | M | L                           | H | H                  |                        |                    |   |                         |   |                    | M                                            |
|                                                                                                                             | CO4      | H                                                                                                                                                                        | M | L                           | H | H                  |                        |                    |   |                         |   |                    | M                                            |
|                                                                                                                             | CO5      | H                                                                                                                                                                        | M | L                           | H | H                  |                        |                    |   |                         |   |                    | M                                            |
| 3                                                                                                                           | Category | Humanities & Social Studies (HS)                                                                                                                                         |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                             |          |                                                                                                                                                                          |   |                             |   |                    |                        |                    |   | √                       |   |                    |                                              |
| 4                                                                                                                           | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016                                                                                                           |   |                             |   |                    |                        |                    |   |                         |   |                    |                                              |

#### **UNIT I IRRIGATION SYSTEM REQUIREMENTS 8**

Irrigation system – requirements – Gravity and lift irrigation – Supply and demand of water – cropping pattern – Estimation of total and peak crop water requirements – Effective and dependable rainfall -allowable deficit – irrigation efficiency.

#### **UNIT II IRRIGATION SCHEDULING 9**

Frequency of irrigation – Methods of scheduling irrigation – Developing typical schedules – Case studies – Water conveyance Systems – Water measurements.

#### **UNIT III MANAGEMENT 9**

Structural and non structural strategies in water use and management. Conductive use of surface and ground water.

#### **UNIT IV OPERATION 10**

Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Physical and administrative control – Water law.

#### **UNIT V FARMERS INVOLVEMENT 9**

Farmers role in system operation – Farmers committee for water distribution, On – farm management and maintenance of the irrigation system -Government – Father Partnership in irrigation.

#### **TEXT BOOKS:**

1. Dilip Kumar Majumdar, “Irrigation Water Management – Principles and Practice”, Prentice Hall of India Pvt. Ltd., New Delhi, 2000

#### **REFERENCES:**

1. Hand book on Irrigation Water Requirement, R.T. Gandhi, et. al., Water Management Division, Department of Agriculture, Ministry of Agriculture, New Delhi
2. R.T.Gandhi, et .al, Handbook on Irrigation Water Requirements, Water Management Division, Department of Agriculture, ministry of Agriculture, New Delhi, 1989.
3. R.E.Robinson, C.M.Laurizen and D.C.Muckel, Distribution Control and Measurement of Irrigation Water on The Form USDA Mise Publication No.926.1989.
4. W.Cly AM, Max , Lowdermilk K and Gilbert Lorey L,”A Research Development Process For Improvement on Form Water Management” - Technical Report No.47, Colorado State, University, Colorado, USA, 1977.
5. Max, K. Lowdermilk Farmer Involvement Planning Guide No.11,”Water Management Synthesis Project”, Utah state University Logan, Utah, 1981.

|                                                                                                                                                  |                                                                                         |                                                                |                             |   |                    |                        |                    |                         |                    |                                              |          |          |   |
|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|---|--------------------|------------------------|--------------------|-------------------------|--------------------|----------------------------------------------|----------|----------|---|
| <b>BCE092</b>                                                                                                                                    | <b>TRANSPORTATION STRUCTURES</b>                                                        |                                                                |                             |   |                    |                        |                    |                         | <b>L</b>           | <b>T</b>                                     | <b>P</b> | <b>C</b> |   |
|                                                                                                                                                  | Total Contact Hours - 45                                                                |                                                                |                             |   |                    |                        |                    |                         | 3                  | 0                                            | 0        | 3        |   |
|                                                                                                                                                  | Prerequisite – Transportation Engineering                                               |                                                                |                             |   |                    |                        |                    |                         |                    |                                              |          |          |   |
|                                                                                                                                                  | Course Designed by – Dept of Civil Engineering                                          |                                                                |                             |   |                    |                        |                    |                         |                    |                                              |          |          |   |
| <b>OBJECTIVES:</b><br>To introduce the students to the basic concepts and principles of transport structures such as bridges, parking facilities |                                                                                         |                                                                |                             |   |                    |                        |                    |                         |                    |                                              |          |          |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                     |                                                                                         |                                                                |                             |   |                    |                        |                    |                         |                    |                                              |          |          |   |
| CO1                                                                                                                                              | To learn about the IRC codes.                                                           |                                                                |                             |   |                    |                        |                    |                         |                    |                                              |          |          |   |
| CO2                                                                                                                                              | To analyze and design the Deck slab and columns in bridges.                             |                                                                |                             |   |                    |                        |                    |                         |                    |                                              |          |          |   |
| CO3                                                                                                                                              | Designing the substructures.                                                            |                                                                |                             |   |                    |                        |                    |                         |                    |                                              |          |          |   |
| CO4                                                                                                                                              | To perform the design of Steel Bridges                                                  |                                                                |                             |   |                    |                        |                    |                         |                    |                                              |          |          |   |
| CO5                                                                                                                                              | To perform the designing of parking, and different amenities related to transportation. |                                                                |                             |   |                    |                        |                    |                         |                    |                                              |          |          |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                      |                                                                                         |                                                                |                             |   |                    |                        |                    |                         |                    |                                              |          |          |   |
| 1                                                                                                                                                | COs/POs                                                                                 | a                                                              | b                           | c | d                  | e                      | f                  | g                       | h                  | i                                            | j        | k        | l |
| 2                                                                                                                                                | CO1                                                                                     | H                                                              |                             |   |                    |                        |                    |                         |                    |                                              |          |          |   |
|                                                                                                                                                  | CO2                                                                                     | H                                                              |                             |   |                    |                        | H                  |                         |                    |                                              |          |          |   |
|                                                                                                                                                  | CO3                                                                                     |                                                                |                             | H |                    |                        |                    |                         |                    |                                              |          |          |   |
|                                                                                                                                                  | CO4                                                                                     |                                                                |                             | H |                    |                        |                    |                         |                    |                                              |          |          |   |
|                                                                                                                                                  | CO5                                                                                     | M                                                              |                             | H |                    |                        |                    |                         |                    |                                              |          |          |   |
| 3                                                                                                                                                | Category                                                                                | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |          |          |   |
|                                                                                                                                                  |                                                                                         |                                                                |                             |   |                    |                        |                    | √                       |                    |                                              |          |          |   |
| 4                                                                                                                                                | Approval                                                                                | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |   |                    |                        |                    |                         |                    |                                              |          |          |   |

IRC Code provision, loading standard, impact loads, theories of load distribution in bridge docks  
– Charts and curves for deck slab design.

## **UNIT II BALANCED CANTILEVER BRIDGES 9**

Balanced cantilever bridges and bearing. Advantages, general proportions for spans, impact factors – Influence lines for B.M. and S.F. at critical sections. Design of main girders and articulation. Types of bearings, design of bearings for girder bridges.

## **UNIT III BRIDGE SUBSTRUCTURES 10**

Types of bridge structures-Piers abutments-shallow and deep foundations – General arrangements (descriptive study only) - Design of single and multiple vent box culverts. Moment distribution method.

## **UNIT IV STEEL BRIDGES 9**

Steel bridges for highway and railway locations – Selection of Types and its advantages – Comparison with R.C.C. bridges – Design of deck and through bridges and bearing.

## **UNIT V AMENITIES 9**

Design of depot buildings, parking lots, terminals, box culverts.

### **TEXT BOOKS**

1. Johnson Victor D., “Essentials of Bridge Engineering”, Oxford and IBH Publishing Co., New Delhi, 1990.

### **REFERENCES:**

1. JaiKrishna & Jain O.P., “Plain and Reinforced Concrete” Vol. 1 NemChand & Bros. Roorkee. 1987
2. Ramachandra, “Design of Steel Structures”, Standard Pub, New Delhi 2013.
3. Fredrick W. Taylor E.Thompson & Edward Smulski, “Reinforced Concrete Bridges”, John Wiley & Sons, Inc, New York 1939.

### **OPEN ELECTIVE-I**

|                                                                                                            |                                                                                                                 |          |          |          |          |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----------|----------|----------|----------|
| <b>BCE093</b>                                                                                              | <b>REMOTE SENSING AND GIS</b>                                                                                   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                                                                                                            | Total Contact Hours - 45                                                                                        | 3        | 0        | 0        | 3        |
|                                                                                                            | Prerequisite-Engineering Physics – II                                                                           |          |          |          |          |
|                                                                                                            | Course Designed by – Dept of Civil Engineering                                                                  |          |          |          |          |
| <b>OBJECTIVES:</b>                                                                                         |                                                                                                                 |          |          |          |          |
| 1. To introduce the students to the basic concepts and principles of various components of remote sensing. |                                                                                                                 |          |          |          |          |
| 2. To provide an exposure to GIS and its practical applications in civil engineering.                      |                                                                                                                 |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>                                                                               |                                                                                                                 |          |          |          |          |
| CO1                                                                                                        | Apply the concepts of Electro Magnetic energy, spectrum and spectral signature curves in the practical problems |          |          |          |          |
| CO2                                                                                                        | Apply the concepts of satellite and sensor parameters and characteristics of different platforms                |          |          |          |          |

|                                                                                                                             |                                                                                 |                                                                |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|----------------------------------------------------------------|---|-----------------------------|---|--------------------|------------------------|--------------------|---|-------------------------|--------------------|----------------------------------------------|---|
| CO3                                                                                                                         | Apply the concepts of DBMS in GIS                                               |                                                                |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| CO4                                                                                                                         | Analyze raster and vector data and modeling in GIS                              |                                                                |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| CO5                                                                                                                         | Apply GIS in land use, disaster management, ITS and resource information system |                                                                |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                 |                                                                |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |
| 1                                                                                                                           | COs/POs                                                                         | a                                                              | b | c                           | d | e                  | f                      | g                  | h | i                       | j                  | k                                            | l |
| 2                                                                                                                           | CO1                                                                             |                                                                |   |                             | H | H                  |                        |                    |   | H                       |                    |                                              |   |
|                                                                                                                             | CO2                                                                             |                                                                |   |                             | H | H                  |                        |                    |   | H                       |                    |                                              |   |
|                                                                                                                             | CO3                                                                             |                                                                |   |                             | H | H                  |                        |                    |   | H                       |                    |                                              |   |
|                                                                                                                             | CO4                                                                             |                                                                |   |                             | H | H                  |                        |                    |   | H                       |                    |                                              |   |
|                                                                                                                             | CO5                                                                             |                                                                |   |                             | H | H                  |                        |                    |   | H                       |                    |                                              |   |
| 3                                                                                                                           | Category                                                                        | Humanities & Social Studies (HS)                               |   | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) |   | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |
|                                                                                                                             |                                                                                 |                                                                |   |                             |   |                    |                        |                    |   |                         | √                  |                                              |   |
| 4                                                                                                                           | Approval                                                                        | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |                        |                    |   |                         |                    |                                              |   |

## UNIT I REMOTE SENSING

9

Definition Historical Components of Remote Sensing Principles & methods of remote sensing - Active and Passive remote sensing - Remote Sensing platforms -Electro magnetic radiation- Spectrum- Block body radiation – planks law – Stefan – Boltzmann law – satellites classification – based on orbit- sun synchronous and Geosynchronous based on purpose Earth Resources satellites, communication satellite Weather satellites Spy satellites Sensors Description of sensor in landscape, spot, IRS series and current satellites- Radar SLAR-and SAR.

## UNIT II EMR INTERACTIONS

9

Interaction with atmosphere Scattering of EMR Raleigh, Mie, Non Selective and Raman Scattering Back scattering Speckle EMR Interaction with water and Ozone Atmospheric windows and its significance EMR interaction with the earth surface materials Radiance, irradiance, Absorbed and Transmitting energy – reflectance- Specular- and diffuse surface- Spectral signature – and curves EMR interaction with soil Resolution Spectral, Spatial, Radiometric, and Temporal.

## UNIT III RESOURCES ENGINEERING

9

Characteristics of Digital satellite image enhancement Filtering Applications of Aerial photographs and satellite imageries – merits – Limitations – Water resources – watershed management – Urban Studies – Flood Management- Fishing Forestry etc.,

## UNIT IV GEOGRAPHIC INFORMATION SYSTEM

9

GIS – Components of GIS – Hardware, Software and Organisational Context – Data – Spatial and Non-Spatial – Maps – Types of Maps – Projection – Types of Projection - Data Input – Digitizer, Scanner – Editing – Raster and Vector data structures – Comparison of Raster and Vector data structure – Analysis using Raster and Vector data – Retrieval, Reclassification, Overlaying, Buffering – Data Output – Printers and Plotters.

**UNIT V MISCELLANEOUS TOPICS****9**

Visual Interpretation of Satellite Images – Elements of Interpretation - Interpretation Keys  
Characteristics of Digital Satellite Image – Image enhancement – Filtering – Classification -  
Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Urban  
Applications- Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS  
– Water resources – Urban Analysis – Watershed Management – Resources Information Systems

**TEXT BOOKS:**

1. Anji Reddy, “Remote Sensing and Geographical Information Systems”, BS Publications 2001

**REFERENCES:**

1. Anand P.H,”Principles of remote Sensing and Geographical Information Systems”, Sri Venkateswara Publishers, 2003.
2. Lillesand T.M and Kiefer R.W. Remote sensing and Image, Interpretation, John Wiley and Sons, INC, New York, 1987.
3. Burrough P A,”Principle of GIS for land resource assessment”, Oxford University, 1990.

|                                                                                                                                   |                                                                                                                                                                                  |   |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|
| <b>BMA00</b><br><b>8</b>                                                                                                          | <b>TOTAL QUALITY MANAGEMENT</b>                                                                                                                                                  | L | T | P | C |
|                                                                                                                                   | Total Contact Hours - 45                                                                                                                                                         | 3 | 0 | 0 | 3 |
|                                                                                                                                   | Prerequisite – Professional Courses                                                                                                                                              |   |   |   |   |
|                                                                                                                                   | Course Designed by – Dept of Mechanical Engineering                                                                                                                              |   |   |   |   |
| <b>OBJECTIVES</b>                                                                                                                 |                                                                                                                                                                                  |   |   |   |   |
| 1. To introduce to the student about the basic terms related to quality and concepts of quality management                        |                                                                                                                                                                                  |   |   |   |   |
| 2. To familiarize the student about the basic principles of total quality management                                              |                                                                                                                                                                                  |   |   |   |   |
| 3. To acquaint the student with the basic statistical tools used in process control                                               |                                                                                                                                                                                  |   |   |   |   |
| 4. To introduce to the student about the various tools used in implementing and checking total quality management                 |                                                                                                                                                                                  |   |   |   |   |
| 5. To familiarize the student about the different quality systems used in auditing the quality of a company/industry/organization |                                                                                                                                                                                  |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                      |                                                                                                                                                                                  |   |   |   |   |
| CO1                                                                                                                               | By understanding about various quality terms, it will be helpful for the student to maintain quality in his/her organization                                                     |   |   |   |   |
| CO2                                                                                                                               | The student will be able to formulate new plans/procedures to be implemented to achieve the desired quality status by knowing about the various principles of quality management |   |   |   |   |
| CO3                                                                                                                               | The student will be able to analyze the periodical data in quality control using statistical tools                                                                               |   |   |   |   |

|                                                                                                                             |                                                                                                                                                                                                                                             |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |
|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|----------------------------------------------|
| CO4                                                                                                                         | The total quality management tools will help the student to understand the procedures in measuring the quality of the organization/process and will also enable him/her to identify the parameters that are improving/depriving the quality |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |
| CO5                                                                                                                         | By knowing about the quality ISO systems, the student will be maintain processes/documentation properly so that the quality maintained by his/her organization gets recognized                                                              |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                                                                                                                                                             |                                                                |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |
| 1                                                                                                                           | COs/POs                                                                                                                                                                                                                                     | a                                                              | b                           | c | d                  | e | f                      | g | h                  | i | j                       | k | l                  |                                              |
| 2                                                                                                                           | CO1                                                                                                                                                                                                                                         |                                                                |                             | M |                    | H |                        | M | H                  | M | L                       | L | M                  |                                              |
|                                                                                                                             | CO2                                                                                                                                                                                                                                         |                                                                |                             | M |                    | H |                        | M | H                  | M | L                       | L | M                  |                                              |
|                                                                                                                             | CO3                                                                                                                                                                                                                                         |                                                                |                             | M |                    | H |                        | M | H                  | M | L                       | L | M                  |                                              |
|                                                                                                                             | CO4                                                                                                                                                                                                                                         |                                                                |                             | H |                    | H |                        | M | H                  | M | L                       | L | M                  |                                              |
|                                                                                                                             | CO5                                                                                                                                                                                                                                         |                                                                |                             | H |                    | H |                        | M | H                  | M | L                       | L | M                  |                                              |
|                                                                                                                             | CO6                                                                                                                                                                                                                                         |                                                                |                             | H |                    | H |                        | M | H                  | M | L                       | L | M                  |                                              |
| 3                                                                                                                           | Category                                                                                                                                                                                                                                    | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) |   | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |
|                                                                                                                             |                                                                                                                                                                                                                                             |                                                                |                             |   |                    |   |                        |   |                    |   | √                       |   |                    |                                              |
| 4                                                                                                                           | Approval                                                                                                                                                                                                                                    | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |   |                    |   |                        |   |                    |   |                         |   |                    |                                              |

## UNIT I INTRODUCTION

9

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs – Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation

## UNIT II TQM PRINCIPLES

9

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDCA Cycle, 5S, Kaizen, Supplier Partnership –Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

## UNIT III STATISTICAL PROCESS CONTROL (SPC)

9

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

## UNIT IV TQM TOOLS

9

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA –Stages of FMEA.

## UNIT V QUALITY SYSTEMS

9

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System –Elements, Implementation of Quality System, Documentation, Quality Auditing, TS16949, ISO 14000 – Concept, Requirements and Benefits

### TEXT BOOKS:

1. Dale H.Besterfield, et al., “Total Quality Management”, Pearson Education, Inc.2003. (Indian reprint 2004). ISBN 81-297-0260-6.

### REFERENCE BOOKS:

1. Evans. J. R. & Lindsay. W.M “The Management and Control of Quality”, (5<sup>th</sup> Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).
2. Feigenbaum. A.V. “Total Quality Management”, McGraw-Hill, 1991.
3. Oakland. J.S. “Total Quality Management”, Butterworth Heinemann Ltd., Oxford, 1989.
4. Narayana V. and Sreenivasan, N.S. “Quality Management – Concepts and Tasks”, New Age International 1996.
5. Zeiri. “Total Quality Management for Engineers”, Wood Head Publishers, 1991.

|                                                                                                                             |         |                                                                                        |   |   |   |   |   |   |   |   |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------|---------|----------------------------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|
| BCE094                                                                                                                      |         | OPTIMIZATION TECHNIQUES                                                                |   |   |   |   |   |   |   | L | T | P | C |
|                                                                                                                             |         | Total Contact Hours - 45                                                               |   |   |   |   |   |   |   | 3 | 0 | 0 | 3 |
|                                                                                                                             |         | Prerequisite – Fundamentals of Computing and Programming                               |   |   |   |   |   |   |   |   |   |   |   |
|                                                                                                                             |         | Course Designed by – Dept of Civil Engineering                                         |   |   |   |   |   |   |   |   |   |   |   |
| OBJECTIVES:                                                                                                                 |         |                                                                                        |   |   |   |   |   |   |   |   |   |   |   |
| 1. To introduce the students to the basic concepts and principles of optimization, linear programming and queuing theory    |         |                                                                                        |   |   |   |   |   |   |   |   |   |   |   |
| COURSE OUTCOMES (COs)                                                                                                       |         |                                                                                        |   |   |   |   |   |   |   |   |   |   |   |
| CO1                                                                                                                         |         | Understanding the Concept of optimization and classification of optimization problems. |   |   |   |   |   |   |   |   |   |   |   |
| CO2                                                                                                                         |         | Formulation simplex methods variable with upper bounds                                 |   |   |   |   |   |   |   |   |   |   |   |
| CO3                                                                                                                         |         | Study the Queuing Model, poisson and exponential distributions                         |   |   |   |   |   |   |   |   |   |   |   |
| CO4                                                                                                                         |         | Understand the maximization and minimization of convex functions                       |   |   |   |   |   |   |   |   |   |   |   |
| CO5                                                                                                                         |         | To study equality constraints, inequality constraints                                  |   |   |   |   |   |   |   |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |         |                                                                                        |   |   |   |   |   |   |   |   |   |   |   |
| 1                                                                                                                           | COs/POs | a                                                                                      | b | c | d | e | f | g | h | i | j | k | l |
| 2                                                                                                                           | CO1     |                                                                                        |   |   |   |   |   | M | H |   |   |   | M |
|                                                                                                                             | CO2     |                                                                                        |   |   |   |   |   | M | H |   |   |   | M |
|                                                                                                                             | CO3     | L                                                                                      |   |   | M |   |   | M | H |   |   |   | M |

|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                             |  |  |  |   |
|---|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---------------------------------------------|--|--|--|---|
|   | CO4      |                                                                |                             |                    |                        |                    |                         | M                  | H                                           |  |  |  | M |
|   | CO5      |                                                                |                             |                    |                        |                    |                         | M                  | H                                           |  |  |  | M |
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/Seminar/ Internship (PR) |  |  |  |   |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                             |  |  |  |   |

### UNIT I INTRODUCTION

8

Concept of optimization – classification of optimization – problems.

### UNIT II LINEAR PROGRAMMING

10

Examples of linear programming problems – formulation simplex methods variable with upper bounds – principle- duality -dual simplex method - sensitivity analysis – revised simplex procedure – solution of the transportation problem – assignment – network minimization – shortest route problem – maximal two problem – L.P.representation of networks.

### UNIT III QUEUING THEORY

9

Queuing Model, poisson and exponential distributions -Queues with combined arrivals and departures- random and series queues.

### UNIT IV UNCONSTRAINED OPTIMIZATION

9

Maximization and minimization of convex functions. Necessary and sufficient conditions for local minima – speed and order of convergence – univariate search – steepest and descent methods- Fletcher reeves method -conjugate gradient method.

### UNIT V CONSTRAINED OPTIMIZATION

9

Necessary and sufficient condition – equality constraints, inequality constraints -kuhn – tucker conditions – gradient projection method – penalty function methods – cutting plane methods of subgradients.

### TEXT BOOKS:

1. Rao S.S, "Optimization – Theory and applications", Wiley Eastern Ltd., 1979.

### REFERENCES:

1. David G.Luenberger, "Introduction to Linear and Non Linear Programming", Addison Wesley Publishing Co. 1973.
2. Hadley G. "Nonlinear and – dynamic programming" Addison Wesley Publishing Co. 1964.
3. Cordan C.C. Beveridge and Robert S. Snelberger, "Optimization, Theory and Practice" McGraw Hill Co.1970.
4. Hardy A.Tahh. "operations Research, An Introduction", Macmillan Publishers Co.NewYork,1982.
5. Beightler and S. others, "Foundations of Optimization Theory", New Delhi, 1979.

### OPEN ELECTIVE-II

|                                                                                                                                      |                                                                                 |                                                                |                             |   |                    |                        |   |                    |   |                         |                    |                                              |   |
|--------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|---|--------------------|------------------------|---|--------------------|---|-------------------------|--------------------|----------------------------------------------|---|
| BCE095                                                                                                                               | GEOGRAPHICS INFORMATION SYSTEM                                                  |                                                                |                             |   |                    |                        |   |                    |   | L                       | T                  | P                                            | C |
|                                                                                                                                      | Total Contact Hours - 45                                                        |                                                                |                             |   |                    |                        |   |                    |   | 3                       | 0                  | 0                                            | 3 |
|                                                                                                                                      | Prerequisite – Remote Sensing and GIS                                           |                                                                |                             |   |                    |                        |   |                    |   |                         |                    |                                              |   |
|                                                                                                                                      | Course Designed by – Dept of Civil Engineering                                  |                                                                |                             |   |                    |                        |   |                    |   |                         |                    |                                              |   |
| OBJECTIVES:<br>To introduce the students to the basic concepts and principles of various components of Geographic Information System |                                                                                 |                                                                |                             |   |                    |                        |   |                    |   |                         |                    |                                              |   |
| COURSE OUTCOMES (COs)                                                                                                                |                                                                                 |                                                                |                             |   |                    |                        |   |                    |   |                         |                    |                                              |   |
| CO1                                                                                                                                  | To procure knowledge about History and development of GIS                       |                                                                |                             |   |                    |                        |   |                    |   |                         |                    |                                              |   |
| CO2                                                                                                                                  | Apply the concept of Data Entry, Storage & Maintenance                          |                                                                |                             |   |                    |                        |   |                    |   |                         |                    |                                              |   |
| CO3                                                                                                                                  | Apply the concepts of DBMS in GIS                                               |                                                                |                             |   |                    |                        |   |                    |   |                         |                    |                                              |   |
| CO4                                                                                                                                  | Analyze raster and vector data and modeling in GIS                              |                                                                |                             |   |                    |                        |   |                    |   |                         |                    |                                              |   |
| CO5                                                                                                                                  | Apply GIS in land use, disaster management, ITS and resource information system |                                                                |                             |   |                    |                        |   |                    |   |                         |                    |                                              |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low          |                                                                                 |                                                                |                             |   |                    |                        |   |                    |   |                         |                    |                                              |   |
| 1                                                                                                                                    | COs/POs                                                                         | a                                                              | b                           | c | d                  | e                      | f | g                  | h | i                       | j                  | k                                            | l |
| 2                                                                                                                                    | CO1                                                                             | M                                                              |                             |   | H                  | H                      |   |                    |   | H                       |                    |                                              |   |
|                                                                                                                                      | CO2                                                                             | M                                                              |                             |   | H                  | H                      |   |                    |   | H                       |                    |                                              |   |
|                                                                                                                                      | CO3                                                                             | M                                                              |                             |   | H                  | H                      |   |                    |   | H                       |                    |                                              |   |
|                                                                                                                                      | CO4                                                                             | M                                                              |                             |   | H                  | H                      |   |                    |   | H                       |                    |                                              |   |
|                                                                                                                                      | CO5                                                                             | M                                                              |                             |   | H                  | H                      |   |                    |   | H                       |                    |                                              |   |
| 3                                                                                                                                    | Category                                                                        | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) |   | Engg Sciences (ES) | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/ Seminar/ Internship (PR) |   |
|                                                                                                                                      |                                                                                 |                                                                |                             |   |                    |                        |   |                    |   |                         | √                  |                                              |   |
| 4                                                                                                                                    | Approval                                                                        | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |   |                    |                        |   |                    |   |                         |                    |                                              |   |

## UNIT I INTRODUCTION

9

Definition – Map and amp analysis – Automated cartography, History and development of GIS.  
Hardware requirement -system concepts Coordinate systems - Standard GIS packages.

## UNIT II DATA ENTRY, STORAGE & MAINTENANCE

9

Type of data. Spatial and non-spatial data – Data structure – points – Lines – polygon - Vector and raster Piles and data formats- Data compression.

## UNIT III DATA ANALYSIS OF MODELING

9

Spatial analysis - Data retrieval- Query Simple analysis- Record overlay- vector data analysis- raster data analysis - Modeling in GIS- Digital elevation model- DIM cost and path analysis - Artificial intelligence- Expert system.

**UNIT IV DATA OUTPUT & ERROR ANALYSIS****9**

Types of output data – Display on screen – Printer – Plotter – Other output devices – Sources of errors – Types of error – Elimination. Accuracies.

**UNIT V APPLICATION****9**

GIS Application: Application areas – Resources management – Agriculture Soil – Water Resources management – Cadastral records and US – Integrated remote sensing application with GLS – Knowledge based techniques.

**TEXT BOOKS:**

1. Anji Reddy .M, “Remote sensing and Geographical information system”, B.Publications, 2011.

**REFERENCES:**

1. Chester (England), Geo informational System, Application of GIS and Related Spatial Information Technologies – ASTER Publication Co. 1992.
2. Burrough .P.A, “Principles of GIS for Land Resources Assessment”, Oxford Publication, 2000.
3. Jeffrey Star and Join Estes, “Geographical Information System An Introduction” – Prentice Hall, 1990.

|                                                                                                                             |                                                                                                        |                                                        |   |   |   |   |   |   |   |   |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|
| BCE096                                                                                                                      |                                                                                                        | ENGINEERING ECONOMICS                                  |   |   |   |   |   | L | T | P | C |   |   |
|                                                                                                                             |                                                                                                        | Total Contact Hours - 45                               |   |   |   |   |   | 3 | 0 | 0 | 3 |   |   |
|                                                                                                                             |                                                                                                        | Prerequisite – Management Concepts For Civil Engineers |   |   |   |   |   |   |   |   |   |   |   |
|                                                                                                                             |                                                                                                        | Course Designed by – Dept of Civil Engineering         |   |   |   |   |   |   |   |   |   |   |   |
| OBJECTIVES:                                                                                                                 |                                                                                                        |                                                        |   |   |   |   |   |   |   |   |   |   |   |
| 1. To impart knowledge on Economics and its importance in the field of Engineering                                          |                                                                                                        |                                                        |   |   |   |   |   |   |   |   |   |   |   |
| COURSE OUTCOMES (COs)                                                                                                       |                                                                                                        |                                                        |   |   |   |   |   |   |   |   |   |   |   |
| CO1                                                                                                                         | Have knowledge about the importance of Economics and the factors affecting demand and supply           |                                                        |   |   |   |   |   |   |   |   |   |   |   |
| CO2                                                                                                                         | Have a well-founded knowledge about the cost aspects and cost-output relationship                      |                                                        |   |   |   |   |   |   |   |   |   |   |   |
| CO3                                                                                                                         | Acquire skills in assessing functions and principles of management and also the types of organizations |                                                        |   |   |   |   |   |   |   |   |   |   |   |
| CO4                                                                                                                         | Have knowledge about plant layout and its maintenance                                                  |                                                        |   |   |   |   |   |   |   |   |   |   |   |
| CO5                                                                                                                         | Have knowledge about the concepts of productivity, economic growth and standard of living.             |                                                        |   |   |   |   |   |   |   |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low |                                                                                                        |                                                        |   |   |   |   |   |   |   |   |   |   |   |
| 1                                                                                                                           | COs/POs                                                                                                | a                                                      | b | c | d | e | f | g | h | i | j | k | l |
| 2                                                                                                                           | CO1                                                                                                    |                                                        | H |   |   |   |   | H |   |   |   |   |   |
|                                                                                                                             | CO2                                                                                                    |                                                        | H |   |   |   |   |   |   | M |   |   |   |
|                                                                                                                             | CO3                                                                                                    |                                                        |   | H |   |   | M |   |   |   |   | L |   |
|                                                                                                                             | CO4                                                                                                    |                                                        | H |   |   |   |   |   |   |   |   |   |   |

|   |          |                                                                |                             |                    |                        |                    |                         |                    |                                             |  |  |  |  |
|---|----------|----------------------------------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---------------------------------------------|--|--|--|--|
|   | CO5      |                                                                |                             | H                  |                        |                    |                         |                    |                                             |  |  |  |  |
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/Seminar/ Internship (PR) |  |  |  |  |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                             |  |  |  |  |

### UNIT I BASIC CONCEPT

9

Basic economic concept - importance of economics in engineering- economic and Technical decisions- demand and supply- factors influencing demand- elasticity of demand - demand forecasting- competition.

### UNIT II COST

9

Actual cost and opportunity cost- marginal cost- incremental. costs and sunk cost, fixed and variable cost- short-run long- run cost- cost output relationship- price fixation pricing methods, break even analysis.

### UNIT III PROCESS OF MANAGEMENT

9

Nature of management and its process- contribution of Taylor and. Foyal of management Functions and principles of management- types of organizations- organization charts and Manuals - industrial ownership - types, formation, merits, and demerits management by Objective, management by exception and management information system.

### UNIT IV PLANNING TECHNIQUES

9

Plant location - factors- decisions- plant layout, types, procedure and techniques material handling- principles, equipments and selection- plant maintenance- objective types and techniques

### UNIT V PRODUCTION AND ITS APPLICATION

9

Production, productivity, economic growth and standard of living- factors affecting Productivity - role of work study- human factor- method study-objective and procedures- charting and photographic techniques- SIMO chart - principles of motion economy- work measurement- stop watch time study- ruling concept and systems- allowances - work sampling.

### TEXT BOOK:

1. Varshney and Maheshwari, Managerial Economics
2. Dewett, Modern Economic Theory

### REFERENCE:

1. L.M.Prasad, Principles and Practice of Management, Sultan Chand and Sons.
2. V.P.S.Rao and P.S.Narayana, Principles of Management.

|  |                                    |          |          |          |          |
|--|------------------------------------|----------|----------|----------|----------|
|  | <b>RENEWABLE SOURCES OF ENERGY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|--|------------------------------------|----------|----------|----------|----------|

|                                                                                                                                                       |                                                                         |                                                                |                                   |                       |                           |                       |                            |                       |                                                          |   |   |   |   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------------|-----------------------|---------------------------|-----------------------|----------------------------|-----------------------|----------------------------------------------------------|---|---|---|---|
| <b>BCE097</b>                                                                                                                                         | Total Contact Hours - 45                                                |                                                                |                                   |                       |                           |                       |                            | 3                     | 0                                                        | 0 | 3 |   |   |
|                                                                                                                                                       | Prerequisite – Engineering Earth Science                                |                                                                |                                   |                       |                           |                       |                            |                       |                                                          |   |   |   |   |
|                                                                                                                                                       | Course Designed by – Dept of Civil Engineering                          |                                                                |                                   |                       |                           |                       |                            |                       |                                                          |   |   |   |   |
| <b>OBJECTIVES:</b><br>To impart knowledge on sources and characteristics of various renewable source of energy and strategies for its implementation. |                                                                         |                                                                |                                   |                       |                           |                       |                            |                       |                                                          |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>                                                                                                                          |                                                                         |                                                                |                                   |                       |                           |                       |                            |                       |                                                          |   |   |   |   |
| CO1                                                                                                                                                   | Have knowledge about the various renewable sources of energy            |                                                                |                                   |                       |                           |                       |                            |                       |                                                          |   |   |   |   |
| CO2                                                                                                                                                   | Have a well-founded knowledge about the Primary energy sources          |                                                                |                                   |                       |                           |                       |                            |                       |                                                          |   |   |   |   |
| CO3                                                                                                                                                   | Acquire skills in assessing the suitability of direct energy conversion |                                                                |                                   |                       |                           |                       |                            |                       |                                                          |   |   |   |   |
| CO4                                                                                                                                                   | Have knowledge about bio – energy                                       |                                                                |                                   |                       |                           |                       |                            |                       |                                                          |   |   |   |   |
| CO5                                                                                                                                                   | Have knowledge about solar energy.                                      |                                                                |                                   |                       |                           |                       |                            |                       |                                                          |   |   |   |   |
| Mapping of Course Outcomes with Program outcomes (POs)<br>(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low                           |                                                                         |                                                                |                                   |                       |                           |                       |                            |                       |                                                          |   |   |   |   |
| 1                                                                                                                                                     | COs/POs                                                                 | a                                                              | b                                 | c                     | d                         | e                     | f                          | g                     | h                                                        | i | j | k | l |
| 2                                                                                                                                                     | CO1                                                                     |                                                                | H                                 | H                     |                           |                       |                            |                       |                                                          |   |   |   |   |
|                                                                                                                                                       | CO2                                                                     |                                                                | H                                 | H                     |                           |                       |                            |                       |                                                          |   |   |   |   |
|                                                                                                                                                       | CO3                                                                     |                                                                | H                                 | H                     |                           |                       |                            |                       |                                                          |   |   |   |   |
|                                                                                                                                                       | CO4                                                                     |                                                                | H                                 | H                     |                           |                       |                            |                       |                                                          |   |   |   |   |
|                                                                                                                                                       | CO5                                                                     |                                                                | H                                 | H                     |                           |                       |                            |                       |                                                          |   |   |   |   |
| 3                                                                                                                                                     | Category                                                                | Humanities<br>& Social<br>Studies (HS)                         | Basic<br>Sciences<br>& Maths (BS) | Engg<br>Sciences (ES) | Professional<br>Core (PC) | Core<br>Elective (CE) | Non-Major<br>Elective (NE) | Open<br>Elective (OE) | Project/Term<br>Paper/<br>Seminar/<br>Internship<br>(PR) |   |   |   |   |
|                                                                                                                                                       |                                                                         |                                                                |                                   |                       |                           |                       |                            | √                     |                                                          |   |   |   |   |
| 4                                                                                                                                                     | Approval                                                                | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                                   |                       |                           |                       |                            |                       |                                                          |   |   |   |   |

## UNIT I GENERAL

9

Primary energy sources -direct energy - conversion -comparison with conventional energy-conversion devices.

**SOLAR ENERGY** – Principles of solar energy collection – solar radiation – measurement instruments - data and estimation - types of collectors - characteristics and design principles of different types of collectors - testing of collectors.

## UNIT II SOLAR ENERGY APPLICATIONS

9

Solar thermal applications – water heaters and air heaters performance and applications - simple calculations on solar cooling, solar drying, solar ponds, solar tower concepts and solar furnace.

## UNIT III WIND AND TIDAL ENERGY

9

Energy from the wind – general theory of windmills – design aspects of horizontal axis and vertical axis windmills – applications. Energy from tides and waves – working principles of tidal plants and ocean thermal energy conversion plants – power from geothermal energy – principles of working of geothermal power plants.

#### **UNIT IV      BIO – ENERGY**

**9**

Energy from bio – mass bio – gas plants – various types -design principles of bio – gas plants applications- Energy from waste burning- power plants, utilization of industrial and municipal wastes – energy from the agricultural wastes.

#### **UNIT V      DIRECT ENERGY CONVERSION**

**9**

(Description, principle of working and basic design aspects only) Magneto hydrodynamic systems, thermo electric generators, thermionic generators fuel cells solar cells types, e.m.f. generated, power output, losses and efficiency and applications.

#### **TEXT BOOKS:**

1. [D. Yogi Goswami](#), [Frank Kreith](#)&[Jan F. Kreider](#),” Principles of Solar Energy Engineering”, CRC Press, 2000

#### **REFERENCES:**

1. [John A. Duffie](#), [William A. Beckman](#),”Solar Energy Thermal processes”, John Wiley & Sons; 4th Edition (17 May 2013).
2. [Sukhatme](#) K, [Suhask P. Sukhatme](#),” Solar Energy”, Tata McGraw-Hill Education, 1996
3. Rai G.D,”Solar Energy Utilisation”,Khanna Publishers, 1987
4. [Shao-lee Soo](#),”Direct Energy Conversion”, Prentice-Hall, 1968