

**CURRICULUM AND SYLLABUS  
(R2015)**

**CHOICE BASED CREDIT SYSTEM  
(Applicable to the batches admitted from July 2015)**

**B.Tech -ELECTRONICS AND COMMUNICATION ENGINEERING  
FULL TIME  
I – VIII SEMESTERS**

| <b>SEMESTER I</b>  |          |   |                                    |   |     |   |
|--|----------|---|------------------------------------|---|-----|---|
| Course Code  | Category | Course Title  | L                                  | T | P   | C |
| <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 |
| BFI201 *   | HS       | Foreign/Indian Language   | 3                                  | 0 | 0   | 3 |
| BME102   | ES       | Engineering Graphics – C  | 1                                  | 0 | 3   | 3 |
| BEE101   | ES       | Basic Electrical and Electronics Engineering                      | 2                                  | 0 | 0   | 2 |
| <b>PRACTICAL</b>   |          |   |                                    |   |     |   |
| BCS1L1   | ES       | Computer Practice Laboratory –I                                   | 0                                  | 0 | 3   | 1 |
| BEE1L1   | ES       | Basic Electrical and Electronics Engineering Practices Laboratory | 0                                  | 0 | 3   | 1 |
| BPC1L1/2L1   | BS       | Physics and Chemistry Laboratory#                                 | 0                                  | 0 | 3/3 | 0 |
| BSS1L7   | HS       | Yoga  | 0                                  | 1 | 2   | 1 |
| <p>*Any one of the following courses:BFR201–French, BGM201–German, BJP201– <b>Japanese</b>, 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 Number of Contact Hours = 38</b>  |          |   | <b>Total Number of Credits= 26</b> |   |     |   |

| <b>SEMESTER II</b>  |                 |   |                                    |          |          |          |
|---|-----------------|---|------------------------------------|----------|----------|----------|
| <b>Course Code</b>  | <b>Category</b> | <b>Course Title</b>   | <b>L</b>                           | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>THEORY</b>   |                 |   |                                    |          |          |          |
| 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        |
| BCS201  | ES              | Internet Programming  | 2                                  | 0        | 0        | 2        |
| BSS201  | HS              | Personality Development                                     | 2                                  | 0        | 0        | 2        |
| BBT202  | BS              | Biology for Engineers                                       | 2                                  | 0        | 0        | 2        |
| BME203  | ES              | Basic Mechanical Engineering                                | 2                                  | 0        | 0        | 2        |
| BCE201  | ES              | Basic Civil Engineering                                     | 2                                  | 0        | 0        | 2        |
| <b>PRACTICAL</b>  |                 |   |                                    |          |          |          |
| BCS2L1  | ES              | Internet Practices Lab                                      | 0                                  | 0        | 3        | 1        |
| BCM2L1  | ES              | Basic Civil and Mechanical Engineering Practices Laboratory | 0                                  | 0        | 3        | 1        |
| BPC<br>1L1/2L1  | BS              | Physics and Chemistry Laboratory #                          | 0                                  | 0        | 3/3      | 1        |
| BSS2L4/<br>BSS2L5/<br>BSS2L6  | 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 Number of Contact Hours = 36</b>   |                 |   | <b>Total Number of Credits= 26</b> |          |          |          |

| SEMESTER III                          |          |                                     |                          |   |   |   |
|---------------------------------------|----------|-------------------------------------|--------------------------|---|---|---|
| Code No.                              | Category | Course Title                        | L                        | T | P | C |
| <b>Theory</b>                         |          |                                     |                          |   |   |   |
| BMA301                                | BS       | Mathematics -III                    | 3                        | 2 | 0 | 4 |
| BEE305                                | PC       | Electrical Machines                 | 3                        | 0 | 0 | 3 |
| BEC301                                | PC       | Signals and Systems                 | 4                        | 0 | 0 | 4 |
| BEC302                                | PC       | Principles Of Digital Electronics   | 3                        | 0 | 0 | 4 |
| BEE301                                | PC       | Circuit Theory                      | 3                        | 0 | 0 | 3 |
| BCE306                                | BS       | Environmental Studies               | 3                        | 0 | 0 | 3 |
| <b>Practical</b>                      |          |                                     |                          |   |   |   |
| BEE3L3                                | PC       | Electrical Engineering Lab          | 0                        | 0 | 3 | 2 |
| BEC3L1                                | PC       | Electronic Devices and Circuits Lab | 0                        | 0 | 3 | 2 |
| BEC3L2                                | PC       | Digital Electronics Lab             | 0                        | 0 | 3 | 2 |
| <b>Total No. of Contact Hours: 30</b> |          |                                     | <b>Total Credits: 27</b> |   |   |   |

| SEMESTER IV                           |          |   |                          |   |   |   |
|---------------------------------------|----------|---|--------------------------|---|---|---|
| Code No.                              | Category | Course Title  | L                        | T | P | C |
| <b>Theory</b>                         |          |   |                          |   |   |   |
| BMA402                                | BS       | Numerical Methods                                   | 3                        | 2 | 0 | 4 |
| BEC402                                | PC       | Electronic Circuits                                 | 3                        | 0 | 0 | 3 |
| BEC405                                | PC       | Linear Integrated Circuits                          | 3                        | 0 | 0 | 3 |
| BCS406                                | PC       | Object Oriented Programming and Data Structures     | 3                        | 0 | 0 | 3 |
| BEC403                                | PC       | Electromagnetic Fields and Waves                    | 4                        | 0 | 0 | 4 |
| BEI406                                | PC       | Electronic Instrumentation                          | 3                        | 0 | 0 | 3 |
| <b>Practical</b>                      |          |   |                          |   |   |   |
| BEC4L1                                | PC       | Electronic Circuit Design Lab                       | 0                        | 0 | 3 | 2 |
| BCS4L3                                | PC       | Object Oriented Programming and Data Structures Lab | 0                        | 0 | 3 | 2 |
| BEC4L2                                | PC       | Linear Integrated Circuits Lab                      | 0                        | 0 | 3 | 2 |
| <b>Total No. of Contact Hours: 30</b> |          |   | <b>Total Credits: 26</b> |   |   |   |

| SEMESTER V                            |          |   |                          |   |   |   |
|---------------------------------------|----------|---|--------------------------|---|---|---|
| Code No.                              | Category | Course Title                            | L                        | T | P | C |
| <b>Theory</b>                         |          |   |                          |   |   |   |
| BEC505                                | PC       | Digital Signal Processing               | 4                        | 0 | 0 | 4 |
| BEC502                                | PC       | Microprocessor and Microcontroller      | 3                        | 0 | 0 | 3 |
| BEC504                                | PC       | Communication Engineering-I             | 3                        | 0 | 0 | 3 |
| BMA504                                | BS       | Random Process                          | 3                        | 2 | 0 | 4 |
| BEC5E1                                | OE       | Open Elective I                         | 3                        | 0 | 0 | 3 |
| BEC5E2                                | PE       | Core Elective I                         | 3                        | 0 | 0 | 3 |
| <b>Practical</b>                      |          |   |                          |   |   |   |
| BEC5L1                                | PC       | Digital Signal Processing laboratory    | 0                        | 0 | 3 | 2 |
| BEC5L6                                | PC       | Microprocessor and Microcontroller Lab  | 0                        | 0 | 3 | 2 |
| BEC5L3                                | PC       | Communication Engineering Laboratory -I | 0                        | 0 | 3 | 2 |
| BEC5C1                                | PR       | Comprehension I                         | 0                        | 0 | 0 | 1 |
| <b>Total No. of Contact Hours: 31</b> |          |   | <b>Total Credits: 27</b> |   |   |   |

| SEMESTER VI                           |          |   |                          |   |   |   |
|---------------------------------------|----------|---|--------------------------|---|---|---|
| Code No.                              | Category | Course Title                            | L                        | T | P | C |
| <b>Theory</b>                         |          |   |                          |   |   |   |
| BEC601                                | PC       | Computer Communication and Networks     | 3                        | 0 | 0 | 3 |
| BEC604                                | PC       | Communication Engineering - II          | 3                        | 0 | 0 | 3 |
| BEI 601                               | PC       | Control Systems                         | 4                        | 0 | 0 | 4 |
| BSS601                                | HS       | Value Education and Professional Ethics | 3                        | 0 | 0 | 3 |
| BEC6E3                                | CE       | Core Elective II                        | 3                        | 0 | 0 | 3 |
| BEC6E4                                | NE       | Non-Major Elective -I                   | 3                        | 0 | 0 | 3 |
| <b>Practical</b>                      |          |   |                          |   |   |   |
| BEC6L1                                | PC       | Computer Communication & Networks Lab   | 0                        | 0 | 3 | 2 |
| BEC6L2                                | PC       | Electronics System Design Lab           | 0                        | 0 | 3 | 2 |
| BEC6L3                                | PC       | Communication Engineering –II Lab       | 0                        | 0 | 3 | 2 |
| <b>Total No. of Contact Hours: 28</b> |          |   | <b>Total Credits: 25</b> |   |   |   |

| SEMESTER VII  |          |                               |                           |   |    |   |
|---|----------|-------------------------------|---------------------------|---|----|---|
| Code No.  | Category | Course Title                  | L                         | T | P  | C |
| <b>Theory</b>   |          |                               |                           |   |    |   |
| BEC701  | PC       | Fiber Optic Communication     | 3                         | 0 | 0  | 3 |
| BEC702  | PC       | Digital CMOS VLSI             | 4                         | 0 | 0  | 4 |
| BEC703  | PC       | Microwave Engineering         | 3                         | 0 | 0  | 3 |
| BEC704  | PC       | Antennas and Wave Propagation | 3                         | 0 | 0  | 3 |
| BEC7E5  | NE       | Non-Major Elective -II        | 3                         | 0 | 0  | 3 |
| BEC7E6  | CE       | Core Elective – III           | 3                         | 0 | 0  | 3 |
| <b>Practical</b>  |          |                               |                           |   |    |   |
| BEC7L1  | PC       | Digital CMOS VLSI Lab         | 0                         | 0 | 3  | 2 |
| BEC7L2  | PC       | Optical Communication Lab     | 0                         | 0 | 3  | 2 |
| BEC7L3  | PC       | Microwave Engineering Lab     | 0                         | 0 | 3  | 2 |
| BEC7P1  | PR       | Term Paper                    | 0                         | 0 | 4  | 2 |
| <b>Total No. of Contact Hours: 32 Total Credits: 27</b> |          |                               |                           |   |    |   |
| SEMESTER VIII   |          |                               |                           |   |    |   |
| Code No.  | Category | Course Title                  | L                         | T | P  | C |
| <b>Theory</b>   |          |                               |                           |   |    |   |
| BEC8E7  | OE       | Open Elective-II              | 3                         | 0 | 0  | 3 |
| BEC8E8  | NE       | Non- Major Elective-III       | 3                         | 0 | 0  | 3 |
| <b>Practical</b>  |          |                               |                           |   |    |   |
| BEC8C1  | PR       | Comprehension II              | 0                         | 0 | 0  | 1 |
| BET8P1  | PR       | Project Work                  | 0                         | 0 | 18 | 9 |
| <b>Total No. of Contact Hours:24</b>                    |          |                               | <b>Total Credits : 16</b> |   |    |   |

**Overall credits for the Programme: 200**

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

| S. No. | Sub Area   | Credit As per Semester |           |           |           |           |           |           |           | No. of Credit | % of credit |
|--------|--|------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|---------------|-------------|
|        |  | I                      | II        | III       | IV        | V         | VI        | VII       | VIII      |               |             |
| 1      | Humanities & Social Sciences (HS)                        | 7                      | 6         | -         | -         | -         | 3         | -         | -         | 16            | 8.00        |
| 2      | Maths & Basic Sciences (BS)                              | 9                      | 12        | 7         | 4         | 4         |           |           | -         | 36            | 18.00       |
| 3      | Engineering Sciences (ES)                                | 10                     | 8         | -         | -         | -         | -         | -         | -         | 18            | 09.00       |
| 4      | Professional Core (PC)                                   | -                      | -         | 20        | 22        | 16        | 16        | 19        | -         | 93            | 46.50       |
| 5      | Core Electives (CE)                                      | -                      | -         | -         | -         | 3         | 3         | 3         |           | 9             | 4.5         |
| 6      | Non major Electives (NE)                                 | -                      | -         | C-        | -         | -         | 3         | 3         | 3         | 9             | 4.5         |
| 7      | Open Electives (OE)                                      | -                      | -         | -         | -         | 3         | -         |           | 3         | 6             | 3           |
| 8      | Project Work, Seminar, Internship, Term Paper, etc. (PR) | -                      | -         |           | -         | 1         | -         | 2         | 10        | 13            | 6.50        |
|        | <b>Total Credit</b>                                      | <b>26</b>              | <b>26</b> | <b>27</b> | <b>26</b> | <b>27</b> | <b>25</b> | <b>27</b> | <b>16</b> | <b>200</b>    | <b>100%</b> |
|        | <b>Total Contact Hour</b>                                | <b>38</b>              | <b>33</b> | <b>30</b> | <b>30</b> | <b>31</b> | <b>28</b> | <b>32</b> | <b>24</b> | <b>246Hrs</b> | <b>-</b>    |

### **LIST OF ELECTIVES**

| <b>Code no.</b>                          | <b>Course Title</b>                                  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|--|--|----------|----------|----------|----------|
| <b>Core Elective-I (CE - I)</b>          |  |          |          |          |          |
| BEC503                                   | Transmission lines, Networks and Waveguides          | 3        | 0        | 0        | 3        |
| BEC001                                   | Advanced Computer Architecture                       | 3        | 0        | 0        | 3        |
| BEC008                                   | MEMS and NEMS  | 3        | 0        | 0        | 3        |
| BEC005                                   | Blue Tooth Technology                                | 3        | 0        | 0        | 3        |
| <b>Core Elective – II (CE-II)</b>        |  |          |          |          |          |
| BEC015                                   | ASIC Design  | 3        | 0        | 0        | 3        |
| BEC012                                   | Cryptography and Network Security                    | 3        | 0        | 0        | 3        |
| BEC010                                   | VLSI Design  | 3        | 0        | 0        | 3        |
| BEC703                                   | Cellular Mobile Communication                        | 3        | 0        | 0        | 3        |
| <b>Core Elective – III (CE-III)</b>      |  |          |          |          |          |
| BEC016                                   | Cognitive Radio                                      | 3        | 0        | 0        | 3        |
| BEC002                                   | Integrated Service Digital Network                   | 3        | 0        | 0        | 3        |
| BEC007                                   | Digital Image Processing                             | 3        | 0        | 0        | 3        |
| BEC003                                   | Satellite Communication                              | 3        | 0        | 0        | 3        |
| <b>Non-Major Elective – I (NE-I)</b>     |  |          |          |          |          |
| BCS603                                   | Artificial Intelligence& Expert System               | 3        | 0        | 0        | 3        |
| BBM054                                   | Bio Informatics                                      | 3        | 0        | 0        | 3        |
| BEI605                                   | Embedded Systems Design                              | 3        | 0        | 0        | 3        |
| BCS702                                   | Mobile And Pervasive Computing                       | 3        | 0        | 0        | 3        |
| <b>Non-Major Elective – II (NE-II)</b>   |  |          |          |          |          |
| BCS 701                                  | Grid and Cloud Computing                             | 3        | 0        | 0        | 3        |
| BCS 008                                  | Distributed Operating Systems                        | 3        | 0        | 0        | 3        |
| BCS 002                                  | Neural Networks                                      | 3        | 0        | 0        | 3        |
| <b>Non-Major Elective – III (NE-III)</b> |  |          |          |          |          |
| BBM 405                                  | Biosensors and Transducer                            | 3        | 0        | 0        | 3        |
| BEI 704                                  | Virtual Instrumentation                              | 3        | 0        | 0        | 3        |
| BET 603                                  | Telecommunication Switching Systems                  | 3        | 0        | 0        | 3        |
| <b>Open Elective-I (OE-I)</b>            |  |          |          |          |          |
| BBA008                                   | Total Quality Management                             | 3        | 0        | 0        | 3        |
| BBA001                                   | Principles of Management And Organizational Behavior | 3        | 0        | 0        | 3        |
| BBA004                                   | Engineering Economics and Financial Management       | 3        | 0        | 0        | 3        |
| BBA009                                   | Intellectual Property Rights                         | 3        | 0        | 0        | 3        |
| BSS001                                   | NSS Paper I  | 2        | 0        | 2        | 3        |
| <b>Open Elective-II (OE-II)</b>          |  |          |          |          |          |
| BEI701                                   | Logic And Distributed Control System                 | 3        | 0        | 0        | 3        |
| BET008                                   | Wireless Networks                                    | 3        | 0        | 0        | 3        |
| BEI012                                   | Analog Integrated Circuit Design                     | 3        | 0        | 0        | 3        |
| BSS002                                   | NSS Paper II   | 2        | 0        | 2        | 3        |

|  |  |  |                     |                    |                        |                    |                         |                    |  |   |   |   |   |
|--|--|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|--|---|---|---|---|
| BMO001   | Massive Open Online Course   | 2  | 0                   | 0                  | 3                      |                    |                         |                    |  |   |   |   |   |
| <b>BEN101</b>  | <b>ENGLISH – 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 English  |  |                     |                    |                        |                    |                         |                    |  |   |   |   |   |
|  | Course Designed by – Dept of English   |  |                     |                    |                        |                    |                         |                    |  |   |   |   |   |
| <b>OBJECTIVES</b>  |  |  |                     |                    |                        |                    |                         |                    |  |   |   |   |   |
| To make the students learn the basic modes of communication for fluency and attainment of confidence in speech, reading and writing. |  |  |                     |                    |                        |                    |                         |                    |  |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>   |  |  |                     |                    |                        |                    |                         |                    |  |   |   |   |   |
| 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  | Able 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 (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 STRUCTURES

12

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  | H  |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
|   | CO2  |  |                             | M |                    | H |                        |   |                    |   |                         |   |                    |  |   |  |
|   | CO3  |  | H                           |   |                    |   | M                      |   |                    |   |                         |   |                    |  |   |  |
|   | CO4  |  |                             |   |                    |   |                        |   | L                  |   |                         |   |                    |  |   |  |
|   | CO5  |  |                             |   |                    |   |                        | H |                    |   | L                       |   |                    |  |   |  |
|   | CO6  |  |                             |   |                    |   |                        |   |                    |   |                         | 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/<br>Term Paper<br>Seminar/<br>Internship (PR) |  |
|   |  |  | √                           |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| 4   | Approval   | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |

### UNIT 1 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.

|  |   |   |   |   |   |   |   |          |          |          |          |   |   |
|--|---|---|---|---|---|---|---|----------|----------|----------|----------|---|---|
| <b>PH101</b>   | <b>ENGINEERING PHYSICS I</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 Physics   |   |   |   |   |   |   |          |          |          |          |   |   |
|  | Course Designed by – Department of Physics  |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>OBJECTIVES:</b>   |   |   |   |   |   |   |   |          |          |          |          |   |   |
| To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology |   |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>COURSE OUTCOMES (COs)</b>   |   |   |   |   |   |   |   |          |          |          |          |   |   |
| 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 (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 application oriented topics required for all engineering branches. |  |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |  |   |   |   |   |   |          |          |          |          |   |   |   |
| CO1   | Understand the principles of water characterization and treatment for portable and industrial purposes.                  |   |   |   |   |   |          |          |          |          |   |   |   |
| CO2   | To impart knowledge on the essential aspects of Principles of polymer chemistry and 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 and 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 and 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 (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 -  $Fe^{2+}$  vs dichromate titrations) Conduct metric 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 electro less 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>

|   |   |   |   |   |   |   |   |          |          |          |          |   |   |
|---|---|---|---|---|---|---|---|----------|----------|----------|----------|---|---|
| <b>BCS101</b>   | <b>FUNDAMENTALS OF COMPUTING AND PROGRAMMING</b>                          |   |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |
|   | Total Contact Hours - 45  |   |   |   |   |   |   | 3        | 0        | 0        | 3        |   |   |
|   | Prerequisite – +2 level Physics   |   |   |   |   |   |   |          |          |          |          |   |   |
|   | Course Designed by – Department of Physics                                |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>OBJECTIVES</b>   |   |   |   |   |   |   |   |          |          |          |          |   |   |
| Students will understand the basics of computers and solve computer oriented problems using various computing tools.        |   |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |   |   |   |   |   |   |   |          |          |          |          |   |   |
| 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 (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 V 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).Byron Gottfried, "Programming with C", 2nd edition, (Indian Adapted Edition), TMH Publication.
2. Pradip Dey, Manas Ghosh, Fundamentals of Computing and Programming in 'C' First Edition, Oxford University Press(2009).
3. The C++ Programming Language, 4<sup>th</sup> Edition, Bjarne Stroustrup, Addison-Wesley Publishing Company (2013).

|   |   |  |   |                     |   |                    |   |                        |   |                    |   |                         |          |                    |          |   |  |
|---|---|--|---|---------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|----------|--------------------|----------|---|--|
| <b>BFR 101</b>  | <b>FRENCH</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>   |   |  |   |                     |   |                    |   |                        |   |                    |   |                         |          |                    |          |   |  |
| Language gives access and insights into another culture. It is a fundamental truth that cultures 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 able to respond in simple everyday contexts.   |  |   |                     |   |                    |   |                        |   |                    |   |                         |          |                    |          |   |  |
| CO4   | Synchronies I includes documents which initiate the learners to another world, another culture and which acclimatize them to the authentic use of the French language through the exploitation of written and iconographic documents. The Indian context has been used. |  |   |                     |   |                    |   |                        |   |                    |   |                         |          |                    |          |   |  |
| CO5   | Grammatical and lexical notions as well as activities required for communication are 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 (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<br/>101</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, 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 (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

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

|   |   |  |                     |                    |                        |                    |                         |                    |   |          |   |   |   |
|---|---|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---|----------|---|---|---|
| <b>BJP 101</b>  | <b>JAPANESE</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>   |   |  |                     |                    |                        |                    |                         |                    |   |          |   |   |   |
| 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.   |   |  |                     |                    |                        |                    |                         |                    |   |          |   |   |   |
| <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 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 (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 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.

| <b>BKR 101</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 (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:

|   |   |  |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
|---|---|--|---|---------------------|---|--------------------|---|------------------------|---|--------------------|----------|-------------------------|----------|--------------------|--|---|--|
| <b>BCN 101</b>  |   | <b>CHINESE</b>   |   |                     |   |                    |   |                        |   | <b>L</b>           | <b>T</b> | <b>P</b>                | <b>C</b> |                    |  |   |  |
|   |   | Total Contact Hours - 60                                       |   |                     |   |                    |   |                        |   | 3                  | 0        | 0                       | 3        |                    |  |   |  |
|   |   | Prerequisite – +2 Level English                                |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
|   |   | Course Designed by – Department of English                     |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| <b>OBJECTIVES</b>   |   |  |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| To have a basic knowledge of Chinese language, Chinese culture and heritage<br>To impart knowledge on Chinese 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 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)<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 (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 RISE OF DIALECTS**

**9**

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

|   |                       |          |
|---|-----------------------|----------|
| <b>UNIT II</b>  | <b>VARIETIES</b>      | <b>9</b> |
| Influences 3 Varieties of Chinese. 1.Classification 2.Standard Chinese and 3.Nomenclature |                       |          |
| <b>UNIT III</b>   | <b>CHARACTERS</b>     | <b>9</b> |
| Chinese characters, Homophones, Phonology   |                       |          |
| <b>UNIT IV</b>  | <b>TRANSCRIPTIONS</b> | <b>9</b> |
| Tones, Phonetic transcriptions, Romanization, Other phonetic transcriptions               |                       |          |
| <b>UNIT V</b>   | <b>GRAMMAR</b>        | <b>9</b> |
| Grammar and morphology, Vocabulary, Loanwords, Modern borrowings and loanwords            |                       |          |

**REFERENCES:**

- 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.
- 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, ISBN HYPERLINK <http://en.wikipedia.org/wiki/Special:BookSources/978-1-55729-071-7>,978-1-55729-071-7.
- 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.
- 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.
- R. L. G. " Language borrowing Why so little Chinese in English?" The Economist. June 6, 2013.

|  |   |          |          |          |          |
|--|---|----------|----------|----------|----------|
| <b>BME 102</b>   | <b>ENGINEERING GRAPHICS - C</b>                     | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|  | Total Contact Hours – 45                            | 3        | 0        | 0        | 3        |
|  | Prerequisite – +2 Level Maths + Physical Science    |          |          |          |          |
|  | Course Designed by – Dept of Mechanical Engineering |          |          |          |          |
| <b>OBJECTIVES</b>  |   |          |          |          |          |
| <ul style="list-style-type: none"> <li>To develop graphical skills in students for communication of concepts, design ideas of engineering products, and expose them to existing standards related to technical drawings.</li> <li>To impart a sound knowledge on the principles of computers involving the different application oriented topics required for all engineering branches.</li> <li>Graduates will demonstrate the ability to apply knowledge of mathematics to develop and analyze computing systems.</li> <li>Graduates will have a solid understanding of the theory and concepts underlying computer science</li> </ul> |   |          |          |          |          |

| COURSE OUTCOMES (COs)   |  |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |
|---|--|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---|---|---|---|---|
| CO1   | To visualize two dimensional graphic representation of three dimensional objects and buildings |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |
| CO2   | To produce two dimensional graphic representation of three dimensional objects and buildings   |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |
| CO3   | To comprehend and visualize 3D views of objects.   |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |
| CO4   | To understand and generate the different curves used in engineering applications.              |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |
| CO5   | To learn and write program in “C”.   |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |
| CO6   | : To introduce the fundamental of CAD Graphics used in design.                                 |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |
| 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 (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 9

Conics-construction of ellipse, parabola and hyperbola by eccentricity method-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.

### UNIT II PROJECTIONS OF PLANES AND SOLIDS 9

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

### UNIT III ORTHOGRAPHIC PROJECTIONS, ISOMETRIC PROJECTIONS & FREE HAND SKETCHING 9

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.

**UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 9**

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.

**UNIT V PERSPECTIVE PROJECTION, BUILDING DRAWING AND COMPUTER AIDED DRAFTING 9**

Perspective projection of cubes 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 Textbook 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.PrabhuRaja, “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

|                |  |          |          |          |          |
|----------------|--|----------|----------|----------|----------|
| <b>BEE 101</b> | <b>BASIC ELECTRICAL AND ELECTRONICS ENGINEERING</b>  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                | Total Contact Hours - 30   | 2        | 0        | 0        | 2        |
|                | Prerequisite – Engineering Mathematics, Engineering Physics-I & II   |          |          |          |          |
|                | Course Designed by – Department of Electrical & Electronics Engineering                                    |          |          |          |          |
|                | <b>OBJECTIVES:</b> To understand the laws of electrical engineering.                                       |          |          |          |          |
|                | <b>COURSE OUTCOMES (COs)</b>   |          |          |          |          |
| 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 (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 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<sup>6</sup>

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<sup>6</sup>

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

### UNIT IV ELECTRON DEVICES

6

Basic Concepts of semiconductor devices – PN Junction Diode Characteristics and

Applications – HWR, FWR – Zener Diode – BJT (CB, CE, CC) configurations & 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 Hill

**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.

|   |   |   |   |   |   |   |          |          |          |          |   |   |   |
|---|---|---|---|---|---|---|----------|----------|----------|----------|---|---|---|
| <b>BCS 1L2</b>  | <b>COMPUTER PRACTICE LABORATORY</b>                               |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |   |
|   | Total Contact Hours - 45  |   |   |   |   |   | 0        | 0        | 3        | 1        |   |   |   |
|   | Prerequisite – Fundamentals of Computer                           |   |   |   |   |   |          |          |          |          |   |   |   |
|   | Course Designed by – Department of Computer Science & Engineering |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>OBJECTIVES:</b> To impart basic computer knowledge   |   |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |   |   |   |   |   |   |          |          |          |          |   |   |   |
| CO1   | Demonstrate major algorithms and data                             |   |   |   |   |   |          |          |          |          |   |   |   |
| CO2   | Implementation of array operations                                |   |   |   |   |   |          |          |          |          |   |   |   |
| CO3   | Implementation of binary tree.                                    |   |   |   |   |   |          |          |          |          |   |   |   |
| CO4   | Implementation of linked list                                     |   |   |   |   |   |          |          |          |          |   |   |   |
| CO5   | Students will be able to do analyse data using spread sheet       |   |   |   |   |   |          |          |          |          |   |   |   |
| CO6   | Student will be 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 (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**

**6**

Document creation, Text manipulation with Scientific Notations. Table creation, Table 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.**

|  |  |          |          |          |          |
|--|--|----------|----------|----------|----------|
| <b>BEE1L1</b>  | <b>BASIC ELECTRICAL AND ELECTRONIC ENGINEERING PRACTICES LABORATORY</b>  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|  | Total Contact Hours – 45   | 0        | 0        | 3        | 1        |
|  | Prerequisite – Basic Electrical and Electronics Engineering              |          |          |          |          |
|  | Course Designed by – Department of Electrical & Electronics Engineering  |          |          |          |          |
| <b>OBJECTIVES:</b> To enhance the student with knowledge on electrical and electronic equipments |  |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>   |  |          |          |          |          |
| 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 (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 & Social Studies (HS)                               | Basic Sciences (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 – 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 – Leeds 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 Fosters 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.

### BSS1L7/BSS2L7 YOGA FOREMPOWERMENT

L T P C  
0 1 2 1

#### OBJECTIVE:

Providing Value Education to improve the Students' character - understanding yogic life and physical health - maintaining youthfulness - Measure and method in five aspects of life

#### UNIT PHYSICAL HEALTH 6

**Manavalakalai (SKY) Yoga:** Introduction - Education as a means for youth empowerment - Greatness of Education - Yoga for youth Empowerment.

**Simplified Physical Exercises:** Hand, Leg, Breathing, Eye exercises - Kapalabathi, Makarasana Part I, Makarasana Part II, Body Massage, Acu pressure, Relaxation exercises - Benefits.

**Yogasanas 1:** Pranamasana - Hastha Uttanasana - Pada Hasthasana - Aswa Sanjalana Asana - Thuvipatha aswa Sanjalana asana - Astanga Namaskara - Bhujangasana - Atha Muktha Savasana - Aswa Sanjalana Asana - Pada Hasthasana - Hastha Uttanasana - Pranamasana.

**Pranayama:** Naddi suddi - Clearance Practice - Benefits.

Simplified Physical Exercise - Kayakalpa Practices - Meditation Practices.

#### UNIT III LIFE FORCE

6

**Reasons for Diseases:** Natural reasons (Genetic / imprints, Planetary Position, Natural calamities and climatic changes) - Unnatural reasons (Food habits, Thoughts, Deeds)

**Philosophy of Kaya kalpa:** Physical body - Sexual vital fluid - Life force - Bio-Magnetism - Mind.

**Maintaining youthfulness:** Postponing old age - Transformation of food into seven components - Importance of sexual vital fluid - Measure and method in five aspects of life - Controlling undue Passion.

**Kayakalpa practice:** Aswini Mudra - Ojas breath - Benefits of Kaya Kalpa.

#### UNIT III MENTAL HEALTH 6

**Mental Frequencies:** Beta, Apha, Theta and Delta wave - Agna Meditation explanation - benefits.

**Shanti meditation:** Shanthi Meditation explanation-benefits

**Thuriya Meditation:** Thuriya Meditation explanation-benefits

**Benefits of Blessing:** Self blessing(Auto suggestion) - Family blessing - Blessing the others - World blessing – Divineprotection

UNITIVVALUES

6

**Human Values:**Self control - Self confidence - Honesty Contentment - Humility -Modesty  
Tolerance – Adjustment - Sacrifice - Forgiveness  
Purity(Body,Dress,Environment) – Physicalpurity-Mentalpurity - Spiritual purity

**Social Values :**

Non violence - Service Patriotism - Equality

Respectforparentsandelders – careandprotection – Respectforteacher Punctuality –  
TimeManagement

**UNIT VMORALITY (virtues)6**

Importance of Introspection: I - Mine (Ego, Possessiveness)

SixEvilTemperaments-Greed-Anger - Miserliness-Immoralsexualpassion –  
InferiorityandsuperiorityComplex - Vengeance

Maneuvering of Six Temperaments: Contentment - Tolerance - Charity - Chastity – Equality  
- Pardon (Forgiveness)

FiveessentialQualitiesacquiredthroughMeditation:Perspicacity – Magnanimity – Receptivity  
- Adaptability – Creativity(ImprovedMemoryPower)

**Total periods: 30**

**REFERENCE BOOKS:**

1. Yoga for modern age – ThathuvagnaniVethathiri Maharishi
2. Simplified Physical Exercises – ThathuvagnaniVethathiri Maharishi
3. Kayakalpam - Thathuvagnani VethathiriMaharishi
4. Thirukkural -Rev.Dr.G.U.Pope
5. Mind-ThathuvagnaniVethathiriMaharishi
6. SoundHealththroughyoga-Dr.Chandrasedkaran
7. Light on yoga -BKS.lyenger
8. உணவுமுறை – தத்துவஞானிவேதாத்திரிமகரிஷி

|  | <b>ENGLISH II</b>                          | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|--|--|----------|----------|----------|----------|
| <b>BEN 201</b>   | Total Contact Hours – 60                   | 3        | 1        | 0        | 3        |
|  | Prerequisite – English I                   |          |          |          |          |
|  | Course Designed by – Department of English |          |          |          |          |
| <b>OBJECTIVES</b>  |  |          |          |          |          |
| Students will be able to actively participate in group discussions. Students will have Telephonic Skills, Giving Directions and Information Transfer |  |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>   |  |          |          |          |          |

|   |   |  |                     |                    |                        |                    |                         |                    |  |   |   |   |   |
|---|---|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|--|---|---|---|---|
| CO1   | To make the students aware to different kinds of Learner-friendly modes of language to a 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 to a 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 (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 Sangeetha Sharma , Technical Communication Principles and Practice, Oxford University Press, 2009.
3. Sangeetha Sharma, Binod M ishra , Communication skills for engineers and scientists , PHI Learning Pvt Ltd, New Delhi, 2010.

|   |  |   |   |   |   |   |          |          |          |          |   |   |   |
|---|--|---|---|---|---|---|----------|----------|----------|----------|---|---|---|
| <b>BMA 201</b>  | <b>MATHEMATICS – II</b>  |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |   |
|   | Total Contact Hours - 60   |   |   |   |   |   | 3        | 1        | 0        | 3        |   |   |   |
|   | Prerequisite – Mathematics I   |   |   |   |   |   |          |          |          |          |   |   |   |
|   | Course Designed by – Department of Mathematics   |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>OBJECTIVES</b>   |  |   |   |   |   |   |          |          |          |          |   |   |   |
| Ability to apply these principles of mathematics in projects and research works.  |  |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |  |   |   |   |   |   |          |          |          |          |   |   |   |
| CO1   | Student shall be able to Solve differential equations, simultaneous linear equations, and some special types of linear equations related to engineering. |   |   |   |   |   |          |          |          |          |   |   |   |
| CO2   | Relate the use of mathematics in applications of various fields namely fluid flow, heat flow, solid mechanics, electrostatics, etc.                      |   |   |   |   |   |          |          |          |          |   |   |   |
| CO3   | Ability to test hypothesis   |   |   |   |   |   |          |          |          |          |   |   |   |
| CO4   | Find intensity of degree of relationship between two variables and also bring out regression 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 (BS) |  | 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 |   |                     |  |                    |   |                        |   |                    |   |                         |  |

### UNIT I ORDINARY DIFFERENTIAL EQUATION 12

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.
- Bali.N.P and Manish Goyal , “Engineering Mathematics“, 3<sup>rd</sup>Edition, Laxmi Publications (P) L Ltd, 2008 .
  - Grewal .B/S “Higher Engineering Mathematics”, 40<sup>th</sup>Editon, Khanna Publications, Delhi, 2007

**REFERENCES :**

- Ramana.B.V, “Higher Engineering Mathematic“, Tata McGraw Hill Publishing Company, New Delhi, 2007.
- 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                            |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>OBJECTIVES</b>   |   |   |   |   |   |   |          |          |          |          |   |   |   |
| <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> |   |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |   |   |   |   |   |   |          |          |          |          |   |   |   |
| 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 (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 Tc 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 – Claussius – 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)

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

|  |   |   |   |   |   |   |   |          |          |          |          |   |   |
|--|---|---|---|---|---|---|---|----------|----------|----------|----------|---|---|
| <b>BCS 202</b>   | <b>INTERNET PROGRAMMING</b>   |   |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |
|  | Total Contact Hours - 30  |   |   |   |   |   |   | 2        | 0        | 0        | 2        |   |   |
|  | Prerequisite – Fundamentals of Computer                                   |   |   |   |   |   |   |          |          |          |          |   |   |
|  | Course Designed by – Dept of Information Technology                       |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>OBJECTIVES</b>  |   |   |   |   |   |   |   |          |          |          |          |   |   |
| <ul style="list-style-type: none"> <li>• To impart a sound knowledge on the principles of computers involving the different application oriented topics required for all engineering branches.</li> <li>• Graduates will demonstrate the ability to apply knowledge of mathematics to develop and analyze computing systems.</li> <li>• Graduates will have a solid understanding of the theory and concepts underlying computer science.</li> </ul> |   |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>COURSE OUTCOMES (COs)</b>   |   |   |   |   |   |   |   |          |          |          |          |   |   |
| CO1  | To enable the student to learn the major components of a computer system. |   |   |   |   |   |   |          |          |          |          |   |   |
| CO2  | To know the correct way of solving problem.                               |   |   |   |   |   |   |          |          |          |          |   |   |
| CO3  | To identify efficient way of solving problem.                             |   |   |   |   |   |   |          |          |          |          |   |   |
| CO4  | To learn to use office automation tools.                                  |   |   |   |   |   |   |          |          |          |          |   |   |
| CO5  | To implement office automation tools                                      |   |   |   |   |   |   |          |          |          |          |   |   |
| CO6  | To learn and write program in “C”.  |   |   |   |   |   |   |          |          |          |          |   |   |
| 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 | M |   | M        |          |          | L        | L | M |
|  | CO2   | H | M | M | H | H |   | M        |          |          | L        | L | M |
|  | CO3   | H | M |   | H | H |   | M        |          |          | L        | L | M |
|  | CO4   | H | M |   | H | H |   | M        |          |          | L        | L | M |
|  | CO5   | H | M | M | H | H |   | M        |          |          | L        | L | M |
|  | CO6   | H |   |   | H | H |   | M        |          |          | L        | L | M |

|   |          |  |                     |                    |                        |                    |                         |                    |   |
|---|----------|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences (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 INTERNET CONCEPTS

6

Internet principles-IP addressing-Internet Service Provider (ISP)-URL-Basic web concepts-World Wide Web (WWW)-Intranet and Extranet-Internet Protocols: HTTP, TCP, UDP, FTP, Telnet-Domain Name System(DNS)-E mail-Next generation internet.

### UNIT II WEB DESIGN BASICS

6

Introduction to HTML-Structure of HTML Document- Tags-Headings-Links-Images-Lists-Tables -Forms-Frames-Style sheets and its types.

### UNIT III DYNAMIC HTML

6

Introduction to Dynamic HTML-Object model and collections-Event model-Filters and transition-Data binding-Data control-Activex control.

### UNIT IV CLIENT AND SERVER SIDE PROGRAMMING

6

VBScript & JavaScript: Introduction-Operators-Data type-Control structures-Looping-Classes and Objects-Arrays-Functions-Events-Example programs.

### UNIT V INTERNET APPLICATIONS

6

Online database-functions of online database-Merits and Demerits-Internet Information Systems (IIS)-EDI applications in business and its types-Internet commerce-Types and Applications

### TEXT BOOKS:

1. Deitel, Deitel and Nieto, "Internet and World Wide Web- How to program", Pearson Education Publishers, 5<sup>th</sup> edition, 2008.
2. Elliotte Rusty Harold, "Java Network Programming", O'Reilly Publishers, 2010
3. Java Script: A Beginners Guide John Pollock 4<sup>th</sup> Edition, TMH Edition (2013)
4. VB Script Beginners Guide, Jyoti B. Giramkar, Create Space Independent Publishing (2014)

### REFERENCES:

- 1... Krishnamoorthy & S.Prabhu, "Internet and Java Programming", New Age International Publishers, 2010.
2. Thomno A.Powell, "The Complete Reference HTML and XHTML", fourth edition, Tata McGraw Hill, 2001
3. E Commerce Kamlesh K.Bajaj, Debjani Nag, Tata McGraw Hill, Second edition, 2010

|   |  |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |  |  |
|---|--|--|---|---------------------|---|--------------------|----------|------------------------|----------|--------------------|---|-------------------------|---|--------------------|--|--|--|
| <b>BSS201</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 conce 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 developme 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 (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>BBT202</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 |  |  |   |                     |                    |                        |                    |   |                         |                    |   |   |   |
|   | 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 |                         |                    |   |   |   |
| 3   | Category   | Humanities & Social Studies (HS)                               |   | Basic Sciences (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 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 e **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>BME201</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 |  |   |                     |   |                    |                        |                            |                         |                    |  |   |   |
| 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 | M                  |                        | M                          |                         |                    | L  | L | M |
|   | CO2  | H  | M | M                   | H | H                  |                        | M                          |                         |                    | L  | L | M |
|   | CO3  | H  | M |                     | H | H                  |                        | M                          |                         |                    | L  | L | M |
|   | CO4  | H  | M |                     | H | H                  |                        | M                          |                         |                    | L  | L | M |
|   | CO5  | H  | M | M                   | H | H                  |                        | M                          |                         |                    | L  | L | M |
|   | CO6  | H  |   |                     | H | H                  |                        | M                          |                         |                    | L  | L | M |
| 3   | Category   | Humanities & Social Studies (HS)                               |   | Basic Sciences (BS) |   | Engg Sciences (ES) | Professional Core (PC) | Professional Elective (PE) | 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 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.

**TEXTBOOK:**

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”,Adiso 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>BCE 201</b> | <b>BASIC CIVIL 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 – Department of Civil Engineering |          |          |          |          |

**OBJECTIVES:** Understand the basic concepts of civil engineering.

**COURSE OUTCOMES (COs)**

|     |  |
|-----|--|
| CO1 | Will gain knowledge in Design, concept preparation                             |
| CO2 | Loading calculation  |
| CO3 | Structural component design  |
| CO4 | Drawing and chart preparation  |
| CO5 | Will understand the components of buildings.                                   |
| CO6 | Will learn the engineering aspects to dams , water supply and sewage disposal. |

**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 |   |   | H |   | L |   |   |   |   |   |
|   | CO2     |   |   |   |   | H | H |   |   |   |   |   |   |
|   | CO3     |   |   |   |   |   |   | H | L |   |   |   |   |
|   | CO4     |   |   |   |   |   |   |   |   | L |   |   |   |
|   | CO5     |   |   |   |   |   |   |   |   |   | H | L |   |
|   | CO6     |   |   |   |   |   |   |   |   |   |   |   |   |

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

### **UNIT I CIVIL ENGINEERING MATERIALS 8**

Introduction – Civil Engineering – Materials – Stones – Bricks – Sand – Cement – Plain Concrete – Reinforced Cement Concrete – Steel Sections – Timber – Plywood – Paints –

### **UNIT II SURVEYING 5**

Surveying – objectives – classification – principles of survey-Measurement of distances – Chain survey – Determination of areas – Use of compass – Use of leveling Instrument – (simple examples only)

### **UNIT III FOUNDATION FOR BUILDING 5**

Bearing Capacity of Soil – Foundation – Functions – Requirement of good foundations – Types of foundations – Merits & Demerits.

### **UNIT IV SUPERSTRUCTURE 7**

Stone Masonry – Brick Masonry – Columns – Lintels – Beams – Roofing – Flooring – Plastering– White Washing (Simple examples only)

### **UNIT V MISCELLANEOUS TOPICS 5**

Types of Bridges –Dam- purpose – selection of site - Types of Dams – Water Treatment & Supply sources – standards of drinking- distribution system. – Sewage Treatment (simple examples only)

#### **TEXT BOOKS:**

1. Raju.K.V.B, Ravichandran .P.T, “Basics of Civil Engineering”, Ayyappa Publications, Chennai, 2012.
2. Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies, (1<sup>st</sup> ed. 2005).
3. Dr.M.S.Palanisamy, “Basic Civil Engineering” (3<sup>rd</sup>ed. 2000), TUG Publishers, New Delhi/Tata McGrawHill Publication Co., New Delhi

#### **REFERENCE BOOKS:**

1. Rangwala.S.C, ”Engineering Materials”, Charotar Publishing House, Anand, 41st Edition: 2014.
2. National Building Code of India, Part V, “Building Materials”, 2005
3. Ramesh Babu“A Textbook on Basic Civil Engineering” (1998). Anuradha Agencies, Kumbakonam.

4. RamamruthamS., “Basic Civil Engineering”, DhanpatRai Publishing Co. (P) Ltd. (1999).

| <b>BCS2L1</b>   |   | <b>INTERNET PRACTICES LABORATORY</b>                           |                     |                    |                        |                    | <b>L</b>                | <b>T</b>           | <b>P</b>                                     | <b>C</b> |   |   |   |
|---|---|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|--|----------|---|---|---|
|   |   | Total Contact Hours - 45                                       |                     |                    |                        |                    | 3                       | 0                  | 0  | 3        |   |   |   |
|   |   | Prerequisite – Internet Programming                            |                     |                    |                        |                    |                         |                    |  |          |   |   |   |
|   |   | Course Designed by – Dept of Information Technology            |                     |                    |                        |                    |                         |                    |  |          |   |   |   |
| <b>OBJECTIVES</b>   |   |  |                     |                    |                        |                    |                         |                    |  |          |   |   |   |
| <ul style="list-style-type: none"> <li>To impart a sound knowledge on the principles of computers involving the different application oriented topics required for all engineering branches.</li> <li>Graduates will demonstrate the ability to apply knowledge of mathematics to develop and analyze computing systems.</li> <li>Graduates will have a solid understanding of the theory and concepts underlying Computerscience.</li> </ul> |   |  |                     |                    |                        |                    |                         |                    |  |          |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |   |  |                     |                    |                        |                    |                         |                    |  |          |   |   |   |
| CO1   | To enable the student to learn the major components of a computer system.   |  |                     |                    |                        |                    |                         |                    |  |          |   |   |   |
| CO2   | To know the correct and efficient way of solving problem.                   |  |                     |                    |                        |                    |                         |                    |  |          |   |   |   |
| CO3   | To identify and implement the correct and efficient way of solving problem. |  |                     |                    |                        |                    |                         |                    |  |          |   |   |   |
| CO4   | To learn to use office automation tools.                                    |  |                     |                    |                        |                    |                         |                    |  |          |   |   |   |
| CO5   | To infer from use office automation tools.                                  |  |                     |                    |                        |                    |                         |                    |  |          |   |   |   |
| CO6   | To learn and write program in “C”.  |  |                     |                    |                        |                    |                         |                    |  |          |   |   |   |
| 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                      | M                  |                         | M                  |  |          | L | L | M |
|   | CO2   | H  | M                   | M                  | H                      | H                  |                         | M                  |  |          | L | L | M |
|   | CO3   | H  | M                   |                    | H                      | H                  |                         | M                  |  |          | L | L | M |
|   | CO4   | H  | M                   |                    | H                      | H                  |                         | M                  |  |          | L | L | M |
|   | CO5   | H  | M                   | M                  | H                      | H                  |                         | M                  |  |          | L | L | M |
|   | CO6   | H  |                     |                    | H                      | H                  |                         | M                  |  |          | L | L | M |
| 3   | Category  | Humanities & Social Studies (HS)                               | Basic Sciences (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. HTML (Hypertext Mark-up Language):

- Basics of HTML.  
 How to create HTML Document  
 Steps for creating a simple HTML Program.
- a) Favorite Personality
  - b) Resume Preparation
- 2. ADVANCED HTML:** Advanced Topics of HTML
- a) Time Table
  - b) Table Creation
- 3. JAVASCRIPT:**  
 Script Basics.  
 Incorporating JavaScript into Web page.
- a) Star Triangle
  - b) Temperature Converters
- Script Basics.  
 Incorporating JavaScript into Web page.
- a) Star Triangle
  - b) Temperature Converters
- 4. VBSCRIPT:**  
 VBScript Basics.  
 Incorporating VBScript into HTML.
- a) Changing Background Color
  - b) Simple Calculator
- 5. WEB DESIGN:**  
 Inserting External Media in the Web Page.
- a) Forms and Links
  - b) Frames with Links and Lists
- To export a Dream weaver Document as XML File, checking entries, working in frames, windows control, the java script URL.

| <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   |          |          |          |          |
| <b>OBJECTIVES</b>   |   |          |          |          |          |
| To provide exposure to the students with hands on experience on various basic Civil & Mechanical Engineering practices. |   |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>  |   |          |          |          |          |
| 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 (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective | Project/Term Paper/Seminar/ Internship (PR) |   |   |   |   |
|   |          |  |                     |                    |                        |                    |                         |               |   |   |   |   |   |
| 4   | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                     |                    |                        |                    |                         |               |   |   |   |   |   |

## LIST OF EXPERIMENTS

### I. CIVILENGINEERINGPRACTICE

#### Buildings:

- a) Studyofplumbingandcarpentrycomponentsofresidentialandindustrialbuildings.Safetyaspects.

#### PlumbingWorks:

- a) Studyofpipelinejoints,itslocationandfunctions:valves,taps,couplings,unions,reducers,elbowsin householdfittings.
- b) Studyofpipeconnectionsrequirementsforpumpsandturbines.
- c) Preparationofplumbinglinesketchesforwatersupplyandsewageworks.
- d) Hands-on-exercise:Basicpipeconnection ofPVCpipes&G.I.Pipes– Mixedpipematerialconnection–Pipe connectionswithdifferentjoiningcomponents.
- e) Demonstrationofplumbingrequirementsofhigh-risebuildings.

#### CarpentryusingHandtoolsandPowertools:

- a) Studyofthejointsinroofs,doors,windowsandfurniture.
- b) Hands-on-exercise: Woodwork,jointsbysawing,planningandcutting.
- c) Preparationofhalfjoints,MortiseandTenonjoints.

### II MECHANICALENGINEERINGPRACTICE

#### Welding:

- a) Preparationofbuttjoints,lapjointsandteejointsbyarcwelding

#### BasicMachining:

- a) Simple Turning and Taper turning

b) Drilling Practice

**Sheet Metal Work:**

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

**Machine assembly practice:**

- a) Assembling, dismantling and Study of centrifugal pump
- b) Assembling, dismantling and Study of air conditioner
- c) Assembling, dismantling and Study of lathe

**Moulding:**

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

**Fitting:**

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

**Demonstration:**

- a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
- b) 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”, Sci tech Publication, (1999).

|                              |   | <b>PHYSICS AND CHEMISTRY LABORATORY</b> |          |          |          |
|------------------------------|---|---|----------|----------|----------|
|                              |   | <b>L</b>                                | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>BPC<br/>1L1/2L1</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 & Social Studies (HS)                               | Basic Sciences (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 – PHYSICS

14. Determination of Wavelength, and particle size using Laser
15. Determination of acceptance angle in an optical fiber.
16. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
17. Determination of wavelength of mercury spectrum – spectrometer grating
18. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
19. Determination of Young's modulus by Non uniform bending method
20. Determination of specific resistance of a given coil of wire – Carey Foster's Bridge
21. Determination of Young's modulus by uniform bending method
22. Determination of band gap of a semiconductor
23. Determination of Coefficient of viscosity of a liquid –Poiseuille's method
24. Determination of Dispersive power of a prism - Spectrometer
25. Determination of thickness of a thin wire – Air wedge method
26. 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 (Argento metry)
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.

**BSS 1L5 / 2L5**

**NSS PRACTICAL**

**L T P C**

**0 1 2 1**

**OBJECTIVES**

1. Understand the community in which they work and their relation
2. Identify the needs and problems of the community and involve them in problem-solving
3. Develop capacity to meet emergencies and natural disasters
4. Practice national integration and social harmony and
5. Utilize their knowledge in finding practical solutions to individual and community problems.

**1. Regular Activities Programme**

- 1) Traffic regulation
- 2) Working with Police Commissioner's Office
- 3) Working with Corporation of Chennai
- 4) Working with Health Department
- 5) Blind assistance
- 6) Garments collection
- 7) Non-formal education
- 8) Environmental Education, Awareness and Training (EEAT)
- 9) Blood donation

**2.Special Camp Programme**

- A) Legal awareness
- B) Health awareness
- C) First-aid
- D) Career guidance
- E) Leadership training - cum - Cultural Programme
- F) Globalization and its Economic Social Political and Cultural impacts.

**REFERENCE BOOKS:**

1. National Service Scheme Manual, Government of India.
2. Training Programme on National Programme scheme, TISS.
3. Orientation Courses for N.S.S. Programme officers, TISS.
4. Case material as Training Aid for field workers, Gurmeet Hans.
5. Social service opportunities in Hospitals, Kapil K.Krishan, TISS.
6. Social Problems in India, Ram Ahuja.

|                |                          |          |          |          |          |
|----------------|--------------------------|----------|----------|----------|----------|
| <b>BMA 301</b> | <b>MATHEMATICS - III</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                | Total Contact Hours – 75 | 3        | 2        | 0        | 4        |

|  |  |
|--|--|
|  | Prerequisite – Engineering Mathematics I & II  |
|  | Course Designed by – Dept. of Mathematics  |
| <b>OBJECTIVES</b>  |  |
| <ul style="list-style-type: none"> <li>• To introduce Fourier series analysis which is central to many applications in engineering apart</li> <li>• From its use in solving boundary value problems systems.</li> <li>• To acquaint the student with Fourier transform techniques used in wide variety of situations.</li> <li>• To introduce the effective mathematical tools for the solutions of partial differential equations</li> <li>• That model several physical processes and to develop Z transform techniques for discrete time</li> </ul> |  |
| <b>COURSE OUTCOMES (COs)</b>   |  |
| CO1  | Solve a set of algebraic equations representing steady state models formed in engineering problems                     |
| CO2  | Fit smooth curves for the discrete data connected to each other or to use interpolation methods over these data tables |
| CO3  | The trend information from discrete data set through numerical differentiation   |
| CO4  | To summary information through numerical integration   |
| CO5  | Solve PDE models representing spatial and temporal variations in physical systems through numerical method             |
| CO6  | Have the necessary proficiency of using MATLAB for obtaining the above solution  |

**UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+6**

Formation - Solutions of standard types of first order equations - Lagrange's Linear 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 - Parseval's identity - Harmonic Analysis.

**UNIT III BOUNDARY VALUE PROBLEMS 9+6**

Classification of second order linear partial differential equations - Solutions of one - dimensional wave equation, one-dimensional heat equation - Steady state solution of two-dimensional heat equation - Fourier series solutions in Cartesian coordinates

**UNITIV 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 equations 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 - Parseval's identity.

**TEXT BOOKS:**

1. Kreyszig, E., "Advanced Engineering Mathematics" 8<sup>th</sup> Edition, John Wiley and Sons, (Asia) Pvt., Ltd, Singapore, 2000.
2. Grewal, B.S., "Higher Engineering Mathematics" (35<sup>th</sup> Edition), Khanna Publishers, Delhi 2000.

**REFERENCE BOOKS:**

1. Kandasamy, P., Thilakavathy, K., and Gunavathy, K. "Engineering Mathematics", Volumes 1 and 3 (4<sup>th</sup> Edition) S Chand and Co., New.
2. Narayanan, S. Manicavachangam Pillai, T.K. Ramanaiyah, E., "Advanced mathematics for Engineering Students", Volume 2 and 3 (2<sup>nd</sup> Edition), S. Viswanathan (printers & publishers Pvt, Ltd.,) 1992.
3. Venkataraman, M.K., "Engineering Mathematics" Volumes 3-A&B, 13<sup>th</sup> Edition National Publishing Company, Chennai, 1998.
4. Shanmugam, T.N.: <http://www.annauniv.edu/shan/trans.h>

|   |   |  |          |          |          |          |
|---|---|--|----------|----------|----------|----------|
| <b>BEE305</b>   | <b>ELECTRICAL MACHINES</b>  |  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|   | Total Contact Hours – 45  |  | 3        | 0        | 0        | 3        |
|   | Prerequisite – Basic Electronics and Electrical Engineering   |  |          |          |          |          |
|   | Course Designed by – Dept. of Electrical and Electronics Engineering.   |  |          |          |          |          |
| <b>OBJECTIVES</b>   |   |  |          |          |          |          |
| To impart basic knowledge on electrical machines, principles and its operation. |   |  |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>  |   |  |          |          |          |          |
| CO1   | Outline the basics of electrical machines and analyze the characteristics of DC machines.   |  |          |          |          |          |
| CO2   | Understand and implement speed control techniques for practical applications.   |  |          |          |          |          |
| CO3   | Describe the working of transformer and assess its regulation and efficiency on load and no-load.   |  |          |          |          |          |
| CO4   | Know the working concept of different types of induction motor and analyze the operating behavior of induction motor using its performance indices. |  |          |          |          |          |
| CO5   | Explain the basics of synchronous machines and interpret performance characteristics.   |  |          |          |          |          |
| CO6   | An ability to apply knowledge of mathematics, science, and engineering.   |  |          |          |          |          |

**UNIT I CIRCUITS AND TRANSFORMERS**

**9**

Three phase circuits and transformers, Three phase balanced circuits with R-L-C loads, Power measurement in 3 Phase circuit, Two watt meter method, Principle of operation of Transformers, Equivalent circuit, Voltage regulation, Efficiency, Transformer connections.

**UNIT II DC MOTORS**

**9**

Construction, Operating principle of motor, Types, Characteristics, Starting, Speed control, Testing.

**UNIT III INDUCTION MOTORS****9**

Construction, Types, Principle of operation of 3 phase induction motors, Equivalent circuit, Performance calculation, Starting and Speed control.

**UNIT IV SYNCHRONOUS AND SPECIAL MACHINES****9**

Construction of synchronous machines, Types, Induced EMF, Voltage regulation of round rotor alternators. Brushless Alternators, Permanent magnet Synchronous machines, Reluctance machines, Hysteresis motors, Stepper motor.

**UNIT V TRANSMISSION AND DISTRIBUTION****9**

Structure of Electric Power systems, Generation, Transmission, Sub Transmission and Distribution systems, EHVAC and EHVDC transmission systems, Substation layout, Insulators, Cables.

**TEXT BOOKS:**

1. Nasar S.A., " Electric Machines and Power Systems ", Vol. 1, McGraw Hill Inc., New Delhi, 1995.
2. Wadhwa C.L., " Electrical Power Systems ", Wiley eastern Ltd., India, 1985.

**REFERENCE BOOKS:**

1. [www.ceecs.fau.edu](http://www.ceecs.fau.edu)

| <b>BEC301</b>   | <b>SIGNALS AND SYSTEMS</b>  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|---|---|----------|----------|----------|----------|
|   | Total Contact Hours –60   | 3        | 2        | 0        | 4        |
|   | Prerequisite – Engineering Mathematics-II   |          |          |          |          |
|   | Course Designed by – Dept. of Electronics and Communication Engineering.  |          |          |          |          |
| <b>OBJECTIVES</b>   |   |          |          |          |          |
| <ul style="list-style-type: none"> <li>This course trains students for an intermediate level of fluency with signals and systems in both continuous time and discrete time, in preparation for more advanced subjects in digital signal processing (including audio, image and video processing), communication theory, and system theory, control and robotics.</li> </ul> |   |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>  |   |          |          |          |          |
| CO1   | To Understand different types of signals-continuous and discrete, odd and even, periodic and aperiodic etc. Be able to classify systems based on their properties |          |          |          |          |
| CO2   | To familiarize the concepts of transform based continuous time and discrete time analysis of signals and systems  |          |          |          |          |
| CO3   | Analyze continuous time signals and systems by using appropriate mathematical tools   |          |          |          |          |
| CO4   | Analyze sampling process and sampling of discrete time signals.   |          |          |          |          |
| CO5   | Analyze discrete time signals and systems by using appropriate mathematical tools   |          |          |          |          |

|   |   |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |  |  |
|---|---|--|---|---------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|--|--|
| CO6   | Determine Fourier transforms for continuous-time and discrete-time signals (or impulse-response functions), and understand how to interpret and plot Fourier transform magnitude and phase functions. |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |  |  |
| 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                  |   |                        |   |                    |   |                         | H |                    |  |  |  |
|   | CO2   | H  |   |                     | M | H                  |   |                        |   | L                  |   |                         | H |                    |  |  |  |
|   | CO3   | M  |   |                     | H | H                  |   |                        |   |                    |   |                         | H |                    |  |  |  |
|   | CO4   |  |   |                     |   | H                  |   | M                      |   |                    |   | M                       | H |                    |  |  |  |
|   | CO5   | H  | M |                     | M |                    |   |                        |   |                    |   |                         |   |                    |  |  |  |
|   | CO6   | H  | M |                     | M |                    | M |                        |   |                    | M |                         | H |                    |  |  |  |
| 3   | Category  | Humanities & Social Studies (HS)                               |   | Basic Sciences (BS) |   | Engg Sciences (ES) |   | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) |  | Project/Term Paper/Seminar/ Internship (PR)ship (PR) |  |
|   |   |  |   |                     |   |                    |   | √                      |   |                    |   |                         |   |                    |  |  |  |
| 4   | Approval  | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |  |  |

### UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS

12

Continuous time signals (CT signals), discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Exponential, Classification of CT and DT signals - periodic and aperiodic, random signals, CT systems and DT systems, Classification of systems - Linear Time invariant Systems.

### UNIT II ANALYSIS OF C.T. SIGNALS

12

Fourier series analysis, Spectrum of C.T. signals, Fourier Transform and Laplace Transform in Signal Analysis.

### UNIT III LTI-CT SYSTEMS

12

Differential equation, Block diagram representation, Impulse response, Convolution integral, Frequency response, Fourier Methods and Laplace transforms in analysis, State equations and Matrix.

### UNIT IV ANALYSIS OF D.T. SIGNALS

12

Spectrum of D.T. signals, Discrete Time Fourier Transform (DTFT), Discrete Fourier Transform (DFT), Properties of Z-transform in signal analysis.

### UNIT V LTI-DT SYSTEMS

12

Difference equations, Block diagram representation, Impulse response, Convolution SUM, Frequency response, FFT and Z-transform analysis, State variable equation and Matrix.

### TEXT BOOKS:

1. Allan V. Oppenheim, S. Wilsky and S.H. Nawab, "Signals and Systems", Pearson, 2007.

**REFERENCE BOOKS:**

1. B. P. Lathi, "Principles of Linear Systems and Signals", Second Edition, Oxford, 2009.
2. R.E. Zeimer, W.H. Tranter and R.D. Fannin, "Signals & Systems - Continuous and Discrete", Pearson, 2007.
3. John Alan Stuller, "An Introduction to Signals and Systems", Thomson, 20076.
4. www.nptel.ac.in

|   |   |                                  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
|---|---|----------------------------------|---|---|---------------------|---|--------------------|---|------------------------|---|--------------------|----------|-------------------------|----------|--------------------|--|---|--|
| <b>BEC302</b>   | <b>PRINCIPLES OF DIGITAL ELECTRONICS</b>  |                                  |   |   |                     |   |                    |   |                        |   |                    | <b>L</b> | <b>T</b>                | <b>P</b> | <b>C</b>           |  |   |  |
|   | Total Contact Hours – 45  |                                  |   |   |                     |   |                    |   |                        |   |                    | 3        | 0                       | 0        | 3                  |  |   |  |
|   | Prerequisite – Basic Electronics Engineering  |                                  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
|   | Course Designed by – Dept. of Electronics And Communication Engineering.  |                                  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| <b>OBJECTIVES</b>   |   |                                  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| <ul style="list-style-type: none"> <li>• To manipulate across various number system and to compute binary arithmetic operations.</li> <li>• To understand the design of combinational and sequential circuits using gates.</li> <li>• To know the concept of memories and programmable logic devices</li> <li>• To learn the design of asynchronous and synchronous sequential circuits.</li> </ul> |   |                                  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| <b>COURSE OUTCOMES (COs)</b>  |   |                                  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| CO1   | Recall the different number systems and demonstrate the simplification of Boolean expressions using Boolean algebra & K-Map method. |                                  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| CO2   | Analyze the Combinational building blocks.  |                                  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| CO3   | Analyze the sequential building blocks.   |                                  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| CO4   | Develop a state diagram and simplify the given sequential logic.  |                                  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| CO5   | To illustrate the concept of synchronous sequential circuits  |                                  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| CO6   | To illustrate the concept of asynchronous sequential circuits   |                                  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| 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                   | L | M                  |   |                        | M |                    |          | H                       |          |                    |  |   |  |
|   | CO2   | M                                | H | M | H                   |   | M                  |   |                        |   |                    |          | H                       |          |                    |  |   |  |
|   | CO3   | H                                | H |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
|   | CO4   | H                                |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
|   | CO5   | M                                | H | M | H                   |   | M                  |   |                        | M |                    |          | H                       |          |                    |  |   |  |
|   | CO6   | H                                | H | M | H                   |   |                    |   |                        |   | M                  |          |                         | H        |                    |  |   |  |
| 3   | Category  | Humanities & Social Studies (HS) |   |   | Basic Sciences (BS) |   | Engg Sciences (ES) |   | Professional Core (PC) |   | Core Elective (CE) |          | Non-Major Elective (NE) |          | Open Elective (OE) |  | Project/Term Paper/Seminar/ Internship (PR) |  |
|   |   |                                  |   |   |                     |   |                    |   | √                      |   |                    |          |                         |          |                    |  |   |  |

### **UNIT I BASIC CONCEPTS ,BOOLEAN ALGEBRA AND LOGIC GATES 12**

Number systems - Binary, Octal, Decimal, Hexadecimal, conversion from one to another, complement arithmetic, Boolean theorems of Boolean algebra, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map, Quine-McCluskey method of minimization .NAND-NOR implementation of Logic gates, Multilevel gate implementation, Multi output gate implementation, TTL and CMOS logic and their characteristics, Tristate gates.

### **UNIT II COMBINATIONAL CIRCUITS 12**

Problem formulation and design of combinational circuits, Half Adder ,Full adder, Half Subtractor, Full Subtractor, Carry Look Ahead adder, BCD adder, Fast adder, Serial adder/subtractor, Binary Multiplier, Binary Divider, Encoder ,Decoder, Mux / Demux, Code-converters, Parity Generators, Comparators.

### **UNIT III SEQUENTIAL CIRCUIT 12**

Latches, Flip-flops - SR, JK, T, D, Master/Slave FF, Triggering of FF, Realization of one flip flop using other flip flops Analysis of clocked sequential circuits - their design, State minimization, State assignment, Circuit implementation, Registers-Shift registers, Asynchronous Up/Down counter Synchronous Up/Down counters, Modulo-n-counter, Ring counter, Shift counters ,Sequence generators.

### **UNIT IV MEMORY DEVICES 12**

Classification of memories – ROM, ROM organization - PROM, EPROM, EEPROM, EAPROM, RAM – RAM organization – Write operation , Read operation , Memory cycle, Timing wave forms , Memory decoding , memory expansion , Static RAM Cell, Dynamic RAM cell ,Programmable Logic Devices – Programmable Logic Array (PLA) and Programmable Array Logic (PAL) ,Field Programmable Gate Arrays (FPGA), Implementation using ROM, PLA, and PAL.

### **UNIT V SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS 12**

Synchronous Sequential Circuits: General Model – Classification – Design – Use of Algorithmic State Machine – Analysis of Synchronous Sequential Circuits.  
Asynchronous Sequential Circuits: Design of fundamental mode and pulse mode circuits – Incompletely specified State Machines – Problems in Asynchronous Circuits – Design of Hazard Free Switching circuits.

#### **Text Book:**

1. M. Morris Mano, “Digital Design”, 4th Edition, Prentice Hall of India Pvt. Ltd., 2008 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
2. William I. Fletcher, " An Engineering Approach to Digital Design ", Prentice-Hall of India, 1980.

#### **REFERENCE BOOKS:**

1. John F. Wakerly, “Digital Design”, Fourth Edition, Pearson/PHI, 2008
2. John. M Yarbrough, “Digital Logic Applications and Design”, Thomson Learning, 2006.
3. Charles H. Roth. “Fundamentals of Logic Design”, 6th Edition, Thomson Learning, 2013.

4. Donald P. Leach and Albert Paul Malvino, "Digital Principles and Applications", 6th Edition, TMH, 2006.
6. <http://www.electrical4u.com/digital-electronics>

|   |   |                                     |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
|---|---|-------------------------------------|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---|----------|---|---|---|
| <b>BEE301</b>   | <b>CIRCUIT THEORY</b>   |                                     |                             |                    |                        |                    | <b>L</b>                | <b>T</b>           | <b>P</b>                                    | <b>C</b> |   |   |   |
|   | Total Contact Hours-45  |                                     |                             |                    |                        |                    | 3                       | 0                  | 0   | 3        |   |   |   |
|   | Prerequisite- basic Electrical & Electronics Engg   |                                     |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
|   | Course Designed by – Dept of Electrical & Electronics Engineering   |                                     |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
| <b>OBJECTIVES</b>   |   |                                     |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
| To develop problem solving skills and understanding of circuit theory through the application of techniques and principles of electrical circuit analysis to common circuit problems. |   |                                     |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |   |                                     |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
| CO1   | To develop an understanding of the fundamental laws and elements of electric circuits.  |                                     |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
| CO2   | To develop the ability to apply circuit analysis to DC and AC circuits  |                                     |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
| CO3   | To understand advanced mathematical methods such as Laplace and Fourier transforms along with linear algebra and differential equations techniques for solving circuits problem |                                     |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
| CO4   | To learn the "alphabet" of circuits, including wires, resistors, capacitors, inductors, voltage and current sources, and operational amplifiers.                                |                                     |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
| CO5   | Introduce students to different methods involves in analysis both linear and non-linear networks;   |                                     |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
| 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                      | L                  | M                       | L                  |   |          | H | M | M |
|   | CO2   | M                                   | H                           | H                  | M                      | M                  | H                       | M                  | M   |          | L | M | M |
|   | CO3   | H                                   | M                           |                    | H                      | H                  |                         | M                  |   |          | L | L | M |
|   | CO4   | H                                   | M                           |                    | H                      | H                  | L                       | M                  | M   |          | L | M | M |
|   | CO5   | M                                   | M                           | M                  | M                      | H                  |                         | M                  |   |          | L | L | M |
| 3   | Category  | Humanities and Social Sciences (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) |          |   |   |   |

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

**UNIT I BASIC CIRCUIT CONCEPTS 9**

Circuit elements – Kirchoff’s Law – V-I Relationship of R,L and C – Independent Sources – Dependent sources – Simple Resistive circuits – Networks reduction – Voltage division – current source transformation.- Analysis of circuit using mesh current and nodal voltage methods.

**UNIT II SINUSOIDAL STEADY STATE ANALYSIS 9**

Phasor – Sinusoidal steady state response concepts of impedance and admittance – Analysis of simple circuits – Power and power factors — Solution of three phase balanced circuits and three phase unbalanced circuits —Power measurement in three phase circuits.

**UNIT III NETWORK THEOREMS (BOTH AC AND DC CIRCUITS) 9**

Superposition theorem – Thevenin’s theorem - Norton’s theorem-Reciprocity theorem- Maximum power transfer theorem.

**UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS 9**

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input with sinusoidal input.

**UNIT V RESONANCE AND COUPLED CIRCUITS 9**

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

**TEXT BOOKS:**

- 1.Sudhaker A. and Shyam Mohan S.p., “Circuits and Network Analysis and Synthesis” TataMcGraw Hill Co. Ltd., New Delhi, 1994.
2. Hyatt W.H. and Kemmerly J.E. „Engineering Circuits Analysis“, McGraw Hill international Editions,1993.

**REFERENCE BOOKS:**

- 1.Edminister J.A. “Theory and Problems of Electric Circuits “ Schaum’s outline series, McGraw Hill Book Company 2<sup>nd</sup> edition, 1983.
- 3.<http://nptel.ac.in/courses/108102042/>

|               |  |          |          |          |          |
|---------------|--|----------|----------|----------|----------|
| <b>BCE306</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   |  |   |                     |   |                    | M | M                      |   |                    | M |                         |   |                    |  |   |  |
|   | CO2   | L  |   |                     |   |                    | M | H                      |   |                    | H |                         | M |                    |  |   |  |
|   | CO3   |  | H |                     |   |                    |   | H                      |   |                    |   |                         |   |                    |  |   |  |
|   | CO4   |  |   |                     |   |                    |   | M                      |   |                    | M |                         |   |                    |  |   |  |
|   | CO5   | M  | M |                     |   |                    |   | H                      |   |                    |   |                         | H |                    |  |   |  |
|   | CO6   |  |   |                     |   |                    | M | H                      |   |                    | H |                         |   |                    |  |   |  |
| 3   | Category  | Humanities & Social Studies (HS)                               |   | Basic Sciences (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

- a) Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effect on forests and tribal people.
- b) Water resources : Use and over-utilization of surface and ground water, flood, drought conflicts over water, dams-benefits and problems.
- c) 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 conversation 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. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad–380013, 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, Clarendon 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>BEE3L2</b> | <b>ELECTRICAL ENGINEERING LAB</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|---------------|-----------------------------------|----------|----------|----------|----------|

|   |   |   |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
|---|---|---|---|---------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|---|--|
|   |   | Total Contact Hours – 45  |   |                     |   |                    | 0 | 0                      | 3 | 2                  |   |                         |   |                    |  |   |  |
|   |   | Prerequisite –Electrical Engineering,Basic Electrical Engineering Lab |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
|   |   | Course Designed by – Dept. of Electrical andElectronics Engineering.  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| <b>OBJECTIVES</b>   |   |   |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| To understand the performanceofelectricalgenerators, motorsand transformers by conductingdifferent tests                    |   |   |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| <b>COURSE OUTCOMES (COs)</b>  |   |   |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO1   | Experimentally verify the performance characteristics of Generators   |   |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO2   | Experimentally verify the performance characteristics of Motors       |   |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO3   | Experimentally verify the performance characteristics of Transformers |   |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO4   | To verify the performance characteristics of Induction motors.        |   |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO5   | To Understand the concepts of alternators                             |   |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO6   | To verify the performance of compound motors                          |   |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| 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 | H                   | H | H                  |   |                        |   | M                  | M |                         |   |                    |  |   |  |
|   | CO3   | H   |   | H                   | H |                    |   |                        |   |                    |   |                         | H |                    |  |   |  |
|   | CO4   |   | H |                     | H |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
|   | CO5   | M   |   |                     | H |                    |   |                        |   | M                  | M |                         | H |                    |  |   |  |
|   | CO6   |   | H | M                   | H | H                  |   |                        |   |                    |   |                         | H |                    |  |   |  |
| 3   | Category  | Humanities & Social Studies (HS)                                      |   | Basic Sciences (BS) |   | Engg Sciences (ES) |   | Professional Core (PC) |   | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) |  | roject/Term Paper/ Seminar/ Internship (PR) |  |
|   |   |   |   |                     |   | √                  |   |                        |   |                    |   |                         |   |                    |  |   |  |
| 4   | Approval  | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016        |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |

### List of Experiments:

1. Power Measurements in 3-phase circuits.
2. Swinburne's Test.
3. Speed control of DC Shunt motors
4. Load Test on DC shunt generator
5. OCC and Load Test on DC shunt generator
6. OC and SC tests on Transformers
7. Load Test on Transformer.

8. Regulation of alternator by EMF and MMF methods.
9. Equivalent circuit on Single phase induction motor.
10. Load test on DC Compound motor
11. Speed control of DC Compound motor.
12. Study of DC and AC motor starters.

**Experiments beyond the syllabus should be conducted.**

|  |   |  |                     |                    |                        |                    |                         |                    |   |   |   |          |          |          |          |
|--|---|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---|---|---|----------|----------|----------|----------|
| <b>BEC3L1</b>  | <b>ELECTRONIC DEVICES AND CIRCUITS LAB</b>                              |  |                     |                    |                        |                    |                         |                    |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|  | Total Contact Hours – 45  |  |                     |                    |                        |                    |                         |                    |   |   |   | 0        | 0        | 3        | 2        |
|  | Prerequisite –Basic Electronics Engineering Lab                         |  |                     |                    |                        |                    |                         |                    |   |   |   |          |          |          |          |
|  | Course Designed by – Dept. of Electronics andCommunication Engineering. |  |                     |                    |                        |                    |                         |                    |   |   |   |          |          |          |          |
| <b>OBJECTIVES</b>  |   |  |                     |                    |                        |                    |                         |                    |   |   |   |          |          |          |          |
| <ul style="list-style-type: none"> <li>• To be exposed to the characteristics of basic electronic devices</li> <li>• Model the electronic circuits using tools such as PSPICE</li> </ul> |   |  |                     |                    |                        |                    |                         |                    |   |   |   |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>   |   |  |                     |                    |                        |                    |                         |                    |   |   |   |          |          |          |          |
| CO1  | Learn the characteristics of basic electronic devices.                  |  |                     |                    |                        |                    |                         |                    |   |   |   |          |          |          |          |
| CO2  | Learn the Characteristics of UJT  |  |                     |                    |                        |                    |                         |                    |   |   |   |          |          |          |          |
| CO3  | Learn the Characteristics of FET  |  |                     |                    |                        |                    |                         |                    |   |   |   |          |          |          |          |
| CO4  | Learn about Power amplifiers.   |  |                     |                    |                        |                    |                         |                    |   |   |   |          |          |          |          |
| CO5  | Learn about Differential amplifiers                                     |  |                     |                    |                        |                    |                         |                    |   |   |   |          |          |          |          |
| CO6  | To understand the concepts of simulation by using Spice tool            |  |                     |                    |                        |                    |                         |                    |   |   |   |          |          |          |          |
| 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                       |                    |   | M | M |          |          |          |          |
|  | CO2   | M  |                     | H                  | H                      |                    |                         | M                  |   |   |   |          | M        |          |          |
|  | CO3   | M  |                     | H                  | H                      |                    |                         | M                  |   | M | M |          |          |          |          |
|  | CO4   | M  |                     |                    | H                      | H                  |                         |                    |   |   |   |          | L        |          |          |
|  | CO5   | M  | L                   |                    | H                      |                    |                         |                    |   |   |   |          |          |          |          |
|  | CO6   |  | H                   | H                  | H                      |                    | H                       |                    |   |   | M |          |          | H        |          |
| 3  | Category  | Humanities & Social Studies (HS)                               | Basic Sciences (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. CE Transistor Characteristics
2. UJT Characteristics
3. FET Characteristics
4. SCR Characteristics
5. **Power Supplies**
6. Frequency Response of CE, CB and CC Amplifiers with self bias, fixed bias and Collector to Base feedback bias.
7. Source Follower with gate resistance, Bootstrapped.
8. Class A and Class B Power amplifiers
9. Differential Amplifiers, CMRR measurements
10. Spice Simulation of Common Emitter and Common Source amplifiers

**Experiments beyond the syllabus should be conducted.**

| <b>BEC3L2</b>   |   | <b>DIGITAL ELECTRONICS LAB</b> |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |
|---|---|--------------------------------|---|---|---|---|---|----------|----------|----------|----------|---|---|
| Total Contact Hours – 45  |   |                                |   |   |   |   |   | 0        | 0        | 3        | 2        |   |   |
| Prerequisite –Basic Electronics Engineering Lab   |   |                                |   |   |   |   |   |          |          |          |          |   |   |
| Course Designed by – Dept. of Electronics and Communication Engineering.  |   |                                |   |   |   |   |   |          |          |          |          |   |   |
| <b>OBJECTIVES</b>   |   |                                |   |   |   |   |   |          |          |          |          |   |   |
| <ul style="list-style-type: none"> <li>• To know the concepts of Combinational circuits.</li> <li>• To understand the concepts of flip-flops, registers and counters</li> </ul> |   |                                |   |   |   |   |   |          |          |          |          |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |   |                                |   |   |   |   |   |          |          |          |          |   |   |
| CO1   | Learn the basics of gates.  |                                |   |   |   |   |   |          |          |          |          |   |   |
| CO2   | Construct basic combinational circuits and verify their functionalities |                                |   |   |   |   |   |          |          |          |          |   |   |
| CO3   | Apply the design procedures to design basic sequential circuits         |                                |   |   |   |   |   |          |          |          |          |   |   |
| CO4   | Learn about counters  |                                |   |   |   |   |   |          |          |          |          |   |   |
| CO5   | Learn about Shift registers   |                                |   |   |   |   |   |          |          |          |          |   |   |
| CO6   | To understand the basic digital circuits and to verify their operation  |                                |   |   |   |   |   |          |          |          |          |   |   |
| 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   | H                              |   | H | H |   |   | M        |          |          | M        |   | M |
|   | CO3   | H                              |   | H | H |   |   | M        |          | M        | M        |   | M |
|   | CO4   | M                              | M | H | H | H |   |          |          |          |          |   | M |
|   | CO5   | M                              | L |   | H |   |   |          |          |          |          |   |   |
|   | CO6   | H                              | H | H | H |   | H |          |          |          | M        |   | H |

|   |          |  |                     |                    |                        |                    |                         |                    |  |
|---|----------|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|--|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences (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. Study of logic gates.
2. Design and implementation of adders and subtractors using logic gates.
3. Design and implementation of encoder and decoder using logic gates.
4. Design and implementation of multiplexer and demultiplexer using logic gates .
5. Design and implementation of 2-bit magnitude comparator using logic gates,
6. Design and implementation of 16-bit odd/even parity checker.
7. Design and implementation of Flipflops using logic gates.
8. Design and implementation of code converters using logic gates.
9. Design and implementation of counters.
10. Design and Implementation of shift registers.

**Experiments beyond the syllabus should be conducted.**

|  |  |  |  |  |          |          |          |          |
|--|--|--|--|--|----------|----------|----------|----------|
| <b>BMA402</b>  | <b>NUMERICAL METHODS</b>   |  |  |  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|  | Total Contact Hours – 75   |  |  |  | 3        | 2        | 0        | 4        |
|  | Prerequisite – Calculus I & II   |  |  |  |          |          |          |          |
|  | Course Designed by – Dept. of Maths.   |  |  |  |          |          |          |          |
| <b>OBJECTIVES</b>  |  |  |  |  |          |          |          |          |
| <ul style="list-style-type: none"> <li>• To train the students to Predict the system dynamic behavior through solution of ODEs modeling the system</li> <li>• To solve PDE models representing spatial and temporal variations in physical systems through numerical methods.</li> </ul> |  |  |  |  |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>   |  |  |  |  |          |          |          |          |
| CO1  | Solve a set of algebraic equations representing steady state models formed in engineering problems   |  |  |  |          |          |          |          |
| CO2  | Fit smooth curves for the discrete data connected to each other or to use interpolation methods over these data tables                     |  |  |  |          |          |          |          |
| CO3  | Find the trend information from discrete data set through numerical differentiation and Summary information through numerical integration. |  |  |  |          |          |          |          |
| CO4  | Predict the system dynamic behavior through solution of ODEs modeling the system   |  |  |  |          |          |          |          |

|   |  |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                       |  |
|---|--|--|---|---------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|---------------------------------------|--|
| CO5   | Solve PDE models representing spatial and temporal variations in physical systems through numerical methods. |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                       |  |
| CO6   | To train the students with Mathematical techniques to solve problems in Engineering with numerical data.     |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |                                       |  |
| 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                  |   |                         | H |                    |  |                                       |  |
|   | CO2  | H  | H | M                   | M | H                  |   |                        |   | M                  | H |                         | H |                    |  |                                       |  |
|   | CO3  | H  |   |                     |   |                    | H |                        |   |                    |   |                         |   |                    |  |                                       |  |
|   | CO4  | H  |   | M                   |   | H                  |   |                        |   |                    |   |                         |   |                    |  |                                       |  |
|   | CO5  | H  | M |                     |   |                    |   |                        |   | M                  |   |                         |   |                    |  |                                       |  |
|   | CO6  | H  | H | M                   |   | M                  | H |                        |   | L                  | H |                         | H |                    |  |                                       |  |
| 3   | Category   | Humanities & Social Studies (HS)                               |   | Basic Sciences (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 SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEM 9+6

Iterative method, Newton-Raphson method for single variable-solutions of linear system by Gaussian, Gauss-Jordan, Jacobian and Gauss-Siedal methods, Inverse of matrix by Gauss-Jordan method, Eigen value of a matrix power and Jacobian methods.

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

Newton's Divide difference formula, Lagrange's Interpolation, forward and backward difference formula Stirling's, Bessel's central difference formula.

### 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") rule, Double integrals using Trapezoidal and Simpson's rule.

### UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATION 9+6

Single step methods, Taylor series, Euler and modified Euler, Runge Kutta method of first and second order differential equations, multiple step methods, Milne and Adam's -bash forth 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(both implicit and explicit), one dimensional wave equation, Two dimensional, Laplace and Poisson equation.

**TEXT BOOKS:**

1. Sastry.SS “Introductory Numerical Methods” PHI, 2010
2. Jain K.K. Iyengar, S.R.K and Jain, R.K. “Numerical Methods for Scientific and Engineering Computation” 3<sup>rd</sup> edition, New Age International Publications and Co. 1993.

**REFERENCE BOOKS:**

1. Grewal, B.S. “Higher Engineering Mathematics (36<sup>th</sup> edition)” Khanna Publication Delhi .
- 2.Curtis F.Gerald. “Applied Numerical Analysis” 7<sup>th</sup> Edn. Pearson Education, Chennai-600113.
2. Dennis G.Zill and Warren S.Wright. “Advanced Engineering Mathematics”. 3<sup>rd</sup> Edn. Jones & Bartlett Publishers, UK. 1992
4. [www.mathforcollege.com](http://www.mathforcollege.com)

| <b>BEC402</b>  |  | <b>ELECTRONIC CIRCUITS</b>   |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |
|--|--|--|---|---|---|---|---|----------|----------|----------|----------|---|---|
|  |  | Total Contact Hours – 45   |   |   |   |   |   | 3        | 0        | 0        | 3        |   |   |
|  |  | Prerequisite – Basic Electronics Engineering                             |   |   |   |   |   |          |          |          |          |   |   |
|  |  | Course Designed by – Dept. of Electronics And Communication Engineering. |   |   |   |   |   |          |          |          |          |   |   |
| <b>OBJECTIVES</b>  |  |  |   |   |   |   |   |          |          |          |          |   |   |
| <ul style="list-style-type: none"> <li>• Develop the fundamental knowledge about the need for biasing and its various methods.</li> <li>• Analyze the small signal equivalents circuits and high frequency analysis of Bipolar Junction Transistor and Field Effect Transistor</li> <li>• Analyze the methods of constructing feedback amplifiers, oscillators and tuned amplifiers.</li> <li>• Outline the performance of wave shaping circuits, multivibrators and time base generators</li> <li>• Construction of power supplies</li> </ul> |  |  |   |   |   |   |   |          |          |          |          |   |   |
| <b>COURSE OUTCOMES (COs)</b>   |  |  |   |   |   |   |   |          |          |          |          |   |   |
| CO1  | Discuss the concepts of various biasing methods for BJT. Analyze the BJT configurations and BJT amplifiers using small signal model. |  |   |   |   |   |   |          |          |          |          |   |   |
| CO2  | To learn about the large signal amplifiers   |  |   |   |   |   |   |          |          |          |          |   |   |
| CO3  | To learn about the various feedback amplifier.   |  |   |   |   |   |   |          |          |          |          |   |   |
| CO4  | Understand the basic principles of different types of tuned amplifiers and learn the neutralization techniques                       |  |   |   |   |   |   |          |          |          |          |   |   |
| CO5  | Describe the operation of multivibrator circuits, time base generators, and their applications                                       |  |   |   |   |   |   |          |          |          |          |   |   |
| CO6  | Discuss the working and characteristics of regulated power supply and SMPS.  |  |   |   |   |   |   |          |          |          |          |   |   |
| 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 |   | M |          |          | M        |          |   |   |
|  | CO2  | H  |   | H | H |   |   | M        |          |          | M        |   | M |
|  | CO3  | H  |   | H | H |   |   | M        |          | M        | M        |   | M |
|  | CO4  | M  | M | H | H | H |   |          |          |          |          |   | M |
|  | CO5  | M  | L |   | H |   |   |          |          |          |          |   |   |

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

### UNIT I BASIC DEVICE STABILIZATION AND LOW FREQUENCY DESIGN ANALYSIS 9

circuits for BJT, DC and AC Load lines, Stability factor analysis, Temperature compensation methods, biasing circuits for FET's and MOSFET's. Transistor, FET and MOSFET Amplifiers, Equivalent circuit, input and output characteristics, calculation of midband gain, input and output impedance of various amplifiers, cascode amplifier, Darlington Bootstrapping, Differential amplifier, CMRR measurement, Use of current source in Emitter.

### UNIT II LARGE SIGNAL AMPLIFIERS 9

Class A, AB, B, C and D type of operation, efficiency of Class A amplifier with resistive and transformer coupled load, efficiency of Class B, Complementary Symmetry amplifiers, MOSFET Power amplifiers, Thermal stability of Power amplifiers, heat sink design.

### UNIT III FEEDBACK AMPLIFIERS 9

Types of feedback, Effect of feedback on noise, distortion, gain, input and output impedance of the amplifiers, Analysis of Voltage and Current feedback amplifiers, Negative Resistance Oscillator, Barkhausen Criterion for oscillation in feedback oscillator, Mechanism for start of oscillation and stabilization of amplitude, Analysis of RC Oscillators using Cascade connection of Lowpass and Highpass filters, Wein Phase shift and twin-T network, Analysis of LC Oscillators, Colpitts, Hartley, Clapp, Franklin, Armstrong and Miller Oscillator, Quartz Crystal Oscillator circuits.

### UNIT IV TUNED AMPLIFIERS & MULTIVIBRATOR CIRCUITS 9

Tank circuits, Analysis of single tuned amplifier, Double tuned, stagger tuned amplifiers, instability of tuned amplifiers, stabilization techniques, Narrow band neutralization using coil, Broad banding using Hazeltine neutralization, Class C tuned amplifiers and their applications. Efficiency of Class C tuned Amplifier. Astable multivibrators, monostable and bistable multivibrator using similar and complementary transistors, speed up capacitors, Schmitt trigger circuits.

### UNIT V RECTIFIERS, BLOCK OSCILLATORS AND TIMEBASE GENERATORS 9

Half Wave Rectifier - Full Wave Rectifier – Bridge Rectifier – Performance of Rectifiers – Filters – Types of Filters – L, C, LC,  $\pi$  Filters – Ripple Factor Calculation for C, L, LC and  $\pi$  Filter –

Regulators – Shunt and Series Voltage Regulator – IC Regulator – SMPS – Power Control using SCR. RC and RL wave shaping circuits, UJT sawtooth generators, Linearization using constant current circuit, Bootstrap and Miller saw tooth generators, current time base generators, Time base circuits - Voltage-Time base circuit, Current-Time base circuit.

**TEXTBOOK:**

1. Robert L. Boylestad and Louis Nashersky, “Electronic Devices and Circuit Theory”, 10<sup>th</sup> Edition, Pearson Education/ PHI, 2008
2. David A. Bell, “Electronic Devices and Circuits”, Fifth Edition, Oxford University Press, 2000
3. Donald .A. Neamen, Electronic Circuit Analysis and Design –2nd Edition, Tata McGraw Hill, 2009.
4. Millman.J. and Halkias C.C, “Integrated Electronics”, McGraw Hill, 2001.

**REFERENCE BOOKS:**

1. Millman J. and Taub H., “Pulse Digital and Switching Waveforms”, TMH, 2000.
2. Adel.S. Sedra, Kenneth C. Smith, “Micro Electronic Circuits”, 6th Edition, Oxford University.
3. David A., “Bell Electronic Devices and Circuits”, Oxford Higher Education Press, 5th Edition,
4. Behzad Razavi, “Design of Analog CMOS Integrated Circuits”, Tata McGraw Hill, 2007.
5. Paul Gray, Hurst, Lewis, Meyer “Analysis and Design of Analog Integrated Circuits”,

|   |  |   |   |   |   |   |          |          |          |          |   |   |   |
|---|--|---|---|---|---|---|----------|----------|----------|----------|---|---|---|
| <b>BEC405</b>   |  | <b>LINEAR INTEGRATED CIRCUITS</b>                                       |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |   |
|   |  | Total Contact Hours – 45  |   |   |   |   | 3        | 0        | 0        | 3        |   |   |   |
|   |  | Prerequisite – Electronic Circuits-I                                    |   |   |   |   |          |          |          |          |   |   |   |
|   |  | Course Designed by – Dept. of Electronics And Communication Engineering |   |   |   |   |          |          |          |          |   |   |   |
| <b>OBJECTIVES</b>   |  |   |   |   |   |   |          |          |          |          |   |   |   |
| <ul style="list-style-type: none"> <li>• To understand the basic concepts of operational amplifier and its various applications</li> <li>• To understand the basics of PLL and its practical applications.</li> <li>• To know about analog multipliers</li> <li>• To know about various analog switches and different A/D and D/A convertors.</li> <li>• To understand the concepts of switched capacitor filters, Voltage regulator</li> </ul> |  |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |  |   |   |   |   |   |          |          |          |          |   |   |   |
| CO1   | Learn about the basic concepts for the circuit configuration for the design of linear integrated circuits and develops skill to solve engineering problems |   |   |   |   |   |          |          |          |          |   |   |   |
| CO2   | Develop skills to design simple circuits using OP-AMP  |   |   |   |   |   |          |          |          |          |   |   |   |
| CO3   | Gain knowledge about various multiplier circuits, modulators and demodulators  |   |   |   |   |   |          |          |          |          |   |   |   |
| CO4   | Gain knowledge about PLL   |   |   |   |   |   |          |          |          |          |   |   |   |
| CO5   | Learn about various techniques to develop A/D and D/A convertors   |   |   |   |   |   |          |          |          |          |   |   |   |
| CO6   | Develop skills to develop simple filter circuits and various amplifiers and can solve problems related to 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  |   | H |   |   |   | M        |          |          |          |   |   |   |
|   | CO2  | M   |   |   | H | M |          |          |          | M        |   |   |   |

|   |          |  |   |                     |   |                    |   |                        |  |                    |   |                         |   |                    |  |  |  |  |
|---|----------|--|---|---------------------|---|--------------------|---|------------------------|--|--------------------|---|-------------------------|---|--------------------|--|--|--|--|
|   | CO3      | M  | M | M                   |   | M                  |   |                        |  |                    |   |                         | L |                    |  |  |  |  |
|   | CO4      | M  |   |                     |   |                    |   | M                      |  |                    |   |                         | M |                    |  |  |  |  |
|   | CO5      |  | L |                     | M | L                  |   | M                      |  | M                  | M |                         | M |                    |  |  |  |  |
|   | CO6      | M  |   | M                   |   |                    | H |                        |  |                    |   |                         |   |                    |  |  |  |  |
| 3 | Category | Humanities & Social Studies (HS)                               |   | Basic Sciences (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 CIRCUIT CONFIGURATION FOR LINEAR ICs

9

Current mirror and current sources, current Sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Operational Amplifier-DC characteristics-Frequencyresponse characteristics-Stability-Limitations-Frequency Compensation-Slew rate.

### UNIT II APPLICATION OF OPERATIONAL AMPLIFIERS

9

Integrator Voltage to Current convertor, Instrumentation amplifier, Sine wave Oscillators, Low pass and band pass filters, comparator, Multivibrator and Schmitt trigger, Triangle wave generator, Precision rectifier, Log and Antilog amplifiers, Non-linear Linear and Nonlinear Circuits using operational amplifiers and their analysis, Inverting and Non inverting Amplifiers, Differentiator function generator.

### UNIT III ANALOG MULTIPLIER AND PLL

9

Integrator Voltage to Current convertor, Instrumentation amplifier, Sine wave Oscillators, Low pass and band pass filters, comparator, Multivibrator and Schmitt trigger, Triangle wave generator, Precision rectifier, Log and Antilog amplifiers, Non-linear Linear and Nonlinear Circuits using operational amplifiers and their analysis, Inverting and Non inverting Amplifiers, Differentiator function generator.

### UNIT III ANALOG MULTIPLIER AND PLL

9

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications ,Voltage controlled Oscillator, Closed loop analysis of PLL, AM, PM and FSK modulators and demodulators. Frequency synthesizers, **Compander ICs.**

### UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTOR

9

Analog switches, High speed sample and hold circuits and sample and hold IC's, Types of D/A

converter Current driven DAC, Switches for DAC, A/D converter, Flash, Single slope, Dual slope, Successive approximation, DM and ADM, Voltage to Time and Voltage to frequency converters.

**UNIT V SPECIAL FUNCTION IC**

**9**

Timers, Voltage regulators - linear and switched mode types, Switched capacitor filter, Frequency to Voltage converters, Tuned amplifiers, Power amplifiers and Isolation Amplifiers, Video amplifiers, Fiber optics ICs and Opto couplers, Sources fo Noises, Op Amp noise analysis and Low noise OP-Amps.

**TEXT BOOKS:**

1. D.Roy Choudhry, Shail Jain, “Linear Integrated Circuits”, New Age International Pvt.Ltd., 2000.
2. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, 3<sup>rd</sup> Edition, Tata McGraw-Hill, 2007.

**REFERENCE BOOKS:**

1. Ramakant A. Gayakwad, “OP-AMP and Linear ICs”, 4<sup>th</sup> Edition, Prentice Hall- Pearson Education, 2001.
2. Robert F. Coughlin, Frederick F. Driscoll, “Operational Amplifiers and Linear Integrated Circuits”, Sixth Edition, PHI, 2001.
3. B.S. Sonde, “System design using Integrated Circuits”, 2<sup>nd</sup> Edition, New Age Pub, 2001
4. Gray and Meyer, “Analysis and Design of Analog Integrated Circuits”, Wiley International, 2005.
5. Michael Jacob, “Applications and Design with Analog Integrated Circuits”, Prentice Hall of India, 1999
6. William D. Stanley, “Operational Amplifiers with Linear Integrated Circuits”, Pearson Education, 2000
7. S. Salivahanan & V.S. Kanchana Bhaskaran, “Linear Integrated Circuits”, TMH, 2008.
8. www.chegg.com/tutors/

|  |  |          |          |          |          |
|--|--|----------|----------|----------|----------|
| <b>BCS406</b>  | <b>OBJECTED ORIENTED PROGRAMMING AND DATA STRUCTURES</b>                     | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|  | Total Contact Hours - 45   | 3        | 0        | 0        | 3        |
|  | Prerequisite – Fundamentals of Computing and Programming                     |          |          |          |          |
|  | Course Designed by – Dept. of Computer Science Engineering.                  |          |          |          |          |
| <b>OBJECTIVES</b>  |  |          |          |          |          |
| <ul style="list-style-type: none"> <li>• To develop solutions to a given problems using class object concepts.</li> <li>• To understand the concepts of overloading, inheritance and polymorphism</li> <li>• To learn the basic data structures and its operations.</li> </ul> |  |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>   |  |          |          |          |          |
| CO1  | Develop solutions to a given problems using class object concepts.           |          |          |          |          |
| CO2  | Illustrate overloading, inheritance and polymorphism concepts with example   |          |          |          |          |
| CO3  | Explain the basic data structures and its operations                         |          |          |          |          |
| CO4  | Make use of basic data structures to solve problems                          |          |          |          |          |
| CO5  | To develop programs using C++ which forms the basic for advanced programming |          |          |          |          |

| CO6   |          | Outline various searching and sorting algorithms               |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
|---|----------|--|---|-----------------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|---|--|
| 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 |                    |  |   |  |
|   | L        | M  | H |                             |   |                    | M |                        |   |                    |   |                         |   |                    |  |   |  |
|   | CO2      | M  |   |                             | H | M                  |   |                        |   | M                  |   |                         | M |                    |  |   |  |
|   | CO3      | M  | M |                             |   | M                  |   |                        |   |                    |   |                         |   |                    |  |   |  |
|   | CO4      | L  |   |                             |   |                    |   | M                      |   |                    |   |                         | M |                    |  |   |  |
|   | CO5      | H  | H | L                           | M |                    |   | M                      |   | M                  | M |                         | M |                    |  |   |  |
|   | CO6      | 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 DATA ABSTRACTION & OVERLOADING

9

Overview of C++ Structures – Class Scope and Accessing Class Members – Reference Variables – Initialization – Constructors – Destructors – Member Functions and Classes – Friend Function – Dynamic Memory Allocation – Static Class Members – Overloading: Function overloading and Operator Overloading.

### UNIT II INHERITANCE & POLYMORPHISM

9

Base Classes and Derived Classes – Protected Members – Overriding – Public, Protected and Private Inheritance – Constructors and Destructors in derived Classes – Implicit Derived – Class Object To Base – Class Object Conversion – Virtual functions – This Pointer – Abstract Base Classes and Concrete Classes – Virtual Destructors – Dynamic Binding.

### UNIT III LINEAR DATA STRUCTURES

9

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation – singly linked lists – Polynomial Manipulation – Stack ADT – Queue ADT

### UNIT IV NON-LINEAR DATA STRUCTURES

9

Trees – Binary Trees – Binary tree representation and traversals – The Search Tree ADT – Graph and its representations – Graph Traversals – Breadth-first search – Depth-first search – Bi-connectivity.

### UNIT V SORTING AND SEARCHING

9

Sorting algorithms: Insertion sort – Quick sort – Merge sort – Searching: Linear search – Binary Search.

### TEXT BOOKS:

1. Deitel and Deitel, "C++,HowTo Program" ,FifthEdition, PearsonEducation, 2005.
2. BhushanTrivedi,—Programming withANSIC++,AStep-By-Step approach, OxfordUniversityPress, 2010.

**REFERENCE BOOKS:**

1. Goodrich, Michael T., Roberto Tamassia,David Mount, "Data Structuresand Algorithms in C++", 7th Edition, Wiley. 2004
2. Thomas H. Cormen, CharlesE. Leiserson, RonaldL. Rivest andClifford Stein, "Introduction to Algorithms", Second Edition, McGraw Hill, 2002.
3. BjarneStroustrup, "TheC++ProgrammingLanguage",3<sup>rd</sup>Edition,Pearson Education,2007
- 4.EllisHorowitz,SartajSahniandDineshMehta, "Fundamentals ofDataStructures inC++", GalgotiaPublications, 2007.

**OtherReferences:**

1. <http://users.cis.fiu.edu/~weiss/>
2. [www.youtube.com/watch?v=x3aC8F1X8ao](http://www.youtube.com/watch?v=x3aC8F1X8ao)

|  |   |   |   |   |   |          |          |          |          |   |   |   |   |
|--|---|---|---|---|---|----------|----------|----------|----------|---|---|---|---|
| <b>BEC403</b>  | <b>ELECTROMAGNETIC FIELDS AND WAVES</b>   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |   |   |
|  | Total Contact Hours -60   |   |   |   |   | 4        | 0        | 0        | 4        |   |   |   |   |
|  | Prerequisite –Engineering Mathematics-III&Electrical Engineering  |   |   |   |   |          |          |          |          |   |   |   |   |
|  | Course Designed by – Dept. of Electronics And Communication Engineering.  |   |   |   |   |          |          |          |          |   |   |   |   |
| <b>OBJECTIVES</b>  |   |   |   |   |   |          |          |          |          |   |   |   |   |
| To understand and gain complete knowledge about  |   |   |   |   |   |          |          |          |          |   |   |   |   |
| <ul style="list-style-type: none"> <li>• Theorem, Laws, Principle &amp; Applications of Static Electromagnetic Fields</li> <li>• Various Laws of Static Magnetic Field</li> <li>• Various relation &amp; parameters of Electric Field in Dielectrics</li> <li>• Magnetic Field with different structure in Ferromagnetic Materials</li> <li>• Time Varying Electric And Magnetic Fields .</li> </ul> |   |   |   |   |   |          |          |          |          |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>   |   |   |   |   |   |          |          |          |          |   |   |   |   |
| CO1  | To understand the Theorem, Laws, Principle and their related problems over Static Electromagnetic Fields.                                       |   |   |   |   |          |          |          |          |   |   |   |   |
| CO2  | To learn the basic laws in Static Magnetic Field and able to find various parameters with the related problems                                  |   |   |   |   |          |          |          |          |   |   |   |   |
| CO3  | To know how the Electric Field is applied in Dielectrics with various equations and applications  |   |   |   |   |          |          |          |          |   |   |   |   |
| CO4  | To understand how the Magnetic field works with Ferromagnetic Materials   |   |   |   |   |          |          |          |          |   |   |   |   |
| CO5  | To analyse how the Time is Varying in both Electric And Magnetic Fields with various Derivation   |   |   |   |   |          |          |          |          |   |   |   |   |
| CO6  | To understand, and analyse the electromagnetic field distribution which forms the basis for advanced subjects related to electromagnetic field. |   |   |   |   |          |          |          |          |   |   |   |   |
| 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      | M  | M | M                   |   |                    |   | M                      |  |                    | H |                         |   |                    |  |   |  |
|   | CO3      | M  |   |                     |   |                    |   | L                      |  |                    |   |                         | H |                    |  |   |  |
|   | CO4      |  |   |                     |   | H                  |   | M                      |  | M                  | M |                         |   |                    |  |   |  |
|   | CO5      |  | L | M                   | M |                    |   |                        |  | M                  |   |                         |   |                    |  |   |  |
|   | CO6      | M  |   |                     |   | H                  | H |                        |  | H                  |   |                         | H |                    |  |   |  |
| 3 | Category | Humanities & Social Studies (HS)                               |   | Basic Sciences (BS) |   | Engg Sciences (ES) |   | Professional Core (PC) |  | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) |  | Project/Term Paper/Seminar/ Internship (PR)(PR) |  |
|   |          |  |   |                     |   |                    |   | √                      |  |                    |   |                         |   |                    |  |   |  |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                     |   |                    |   |                        |  |                    |   |                         |   |                    |  |   |  |

### **UNIT I                    STATIC ELECTROMAGNETIC FIELDS                    12**

Introduction to co-ordinate system, Gradient, Divergence, Curl, Divergence Theorem, Stoke's Theorem, Coulomb's Law, Electric field Intensity, Principle of superposition, Electric Scalar potential, Line charge distribution by Moment method, Electric flux Density, Gaus's Law and its applications, Field Computations and Problems.

### **UNIT II                    STATIC MAGNETIC FIELD                    12**

Magnetic field of a current carrying element, Ampere's Force law, The Biot-Savart Law, Magnetic Flux density, Gauss law for magnetic fields, Torgue on a loop, Magnetic moment, Ampere's Law and Magnetic field intensity, Magneto motive force, Field cells and permeability, Vector potential, Field computation and problems.

### **UNIT III                    ELECTRIC FIELD IN DIELECTRICS                    12**

Permittivity, Polarization, Boundary relation, Capacitance, Dielectric strength, Energy and energy density, Poisson's and Laplace equations and applications, Electric Current, Current Density, Ohms law at a point, Resistance and Conductance, Continuity relations for current problems.

### **UNIT IV                    MAGNETIC FIELD IN FERROMAGNETIC MATERIALS                    12**

Magnetic materials, Magnetic dipoles, Loops and Solenoids, Magnetization, Inductance, Energy in an Inductor and Energy Density, Boundary relations, Ferro magnetism, Hysteresis, Reluctance and Permeance, Problems.

### **UNIT V                    TIME VARYING ELECTRIC AND MAGNETIC FIELDS                    12**

Faraday's Law, Transformer and Motional Induction, Maxwell's equation from Faraday's Law, Self and Mutual Inductance, Displacement current, Maxwell's equation from Ampere's Law and its inconsistency, Boundary relation, Poynting Vector, Comparison of field and circuit theory, Circuit Application of pointing Vector.

### **TEXT BOOKS:**

1. William H Hayt and Jr John A Buck, “Engineering Electromagnetics”,Tata McGraw-HillPublishing Company Ltd, NewDelhi, 2008
2. Sadiku MH,“Principles of Electromagnetics”, Oxford University PressInc, NewDelhi,2009
3. David K Cheng, “Field and Wave Electromagnetics”, Pearson EducationInc,Delhi,2004

**REFERENCE BOOKS:**

1. John D Kraus and Daniel A Fleisch,“Electromagnetics with Applications”,McGrawHillBook Co,2005
2. Karl E Longman and SavaV Savov,“Fundamentals of Electromagnetics”,Prentice Hall ofIndia,NewDelhi,2006
3. Ashutosh Pramanic,“Electromagnetism”, Prentice Hall of India,NewDelhi,2006
4. www.Wiley.com

|   |   |   |   |   |   |          |          |          |          |   |   |   |   |   |
|---|---|---|---|---|---|----------|----------|----------|----------|---|---|---|---|---|
| <b>BEI406</b>   | <b>ELECTRONIC INSTRUMENTATION</b>   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |   |   |   |
|   | Total Contact Hours - 45  |   |   |   |   | 3        | 0        | 0        | 3        |   |   |   |   |   |
|   | Prerequisite –Electronic Circuits-I   |   |   |   |   |          |          |          |          |   |   |   |   |   |
|   | Course Designed by – Dept. of Electronics and instrumentation Engineering.                          |   |   |   |   |          |          |          |          |   |   |   |   |   |
| <b>OBJECTIVES</b>   |   |   |   |   |   |          |          |          |          |   |   |   |   |   |
| <ul style="list-style-type: none"> <li>• Explain basic concepts and definitions in measurement.</li> <li>• Describe the bridge configurations and their applications.</li> <li>• Elaborate discussion about the importance of signal generators and analyzers in measurements.</li> </ul> |   |   |   |   |   |          |          |          |          |   |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |   |   |   |   |   |          |          |          |          |   |   |   |   |   |
| CO1   | Recognize the evolution and history of units and standards in Measurements                          |   |   |   |   |          |          |          |          |   |   |   |   |   |
| CO2   | Identify the various parameters that are measurable in electronic instrumentation                   |   |   |   |   |          |          |          |          |   |   |   |   |   |
| CO3   | Employ appropriate instruments to measure given sets of parameters                                  |   |   |   |   |          |          |          |          |   |   |   |   |   |
| CO4   | Practice the construction of testing and measuring set up for electronic systems.                   |   |   |   |   |          |          |          |          |   |   |   |   |   |
| CO5   | To have a deep understanding about instrumentation concepts this can be applied to control systems. |   |   |   |   |          |          |          |          |   |   |   |   |   |
| CO6   | Relate the usage of various instrumentation 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   |   | M |   |   |          |          |          |          |   |   |   |   |   |
|   | CO2   | H |   | H |   | M        | L        |          | M        | M |   |   | H |   |
|   | CO3   | M | M | H | H |          |          |          | M        |   | M |   | H |   |
|   | CO4   | H |   | H | H | H        |          |          | M        |   |   |   |   |   |
|   | CO5   |   |   |   | M |          |          |          |          |   | M |   |   | H |
|   | CO6   | H | L |   |   |          |          | H        |          |   |   | L |   |   |

|   |          |  |                       |                    |                        |                    |                         |                    |   |
|---|----------|--|-----------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & (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 TRANSDUCERS 9**

Measurements, Instrumentation, Errors in measurements, Calibration and standard, Classification and characteristics of Transducers, Digital, Electrical, Electronic Weighing System, AC / DC Bridge measurement and their applications.

### **UNIT II SIGNAL GENERATOR AND SIGNAL ANALYZERS 9**

A.F. Generator, Pulse Generator, AM/FM Signal generator, Function generator, Sweep frequency generator, wave analyzers, Spectrum Analyzers, Logic Analyzers, Distortion Analyzers.

### **UNIT III DIGITAL INSTRUMENTS 9**

Digital Voltmeters and Multimeters, Automation in Voltmeters, Accuracy of DVM, Guarding Techniques, frequency, period, time interval and pulsewidth measurements, automatic vector voltmeter.

### **UNIT IV DATA DISPLAY AND RECORDING SYSTEM 9**

CRO, single beam, dual trace, double beam CRO, Digital storage and Analog storage Oscilloscope, sampling Oscilloscope, Power scope, Curve Tracer, Analog, Digital Recorders and Printers.

### **UNIT V COMPUTER CONTROLLED TEST SYSTEM 9**

Testing and Audio amplifier, Testing a Radio Receiver, Instrument used in Computer Controlled Instrumentation, Digital Control Description, Microprocessor based measurements, Isolation and safety standards of Electronic equipments, Case studies in Instrumentation.

#### **TEXT BOOKS:**

1. Rangan C.S., " Instrumentation Devices and Systems ", Tata McGraw Hill, 1998.
2. Cooper, " Electronic Instrumentation and Measurement Techniques ", Prentice Hall of India, 1988.

#### **REFERENCE BOOKS:**

1. H.S.Kalsi, "Electronic Instrumentation", Tata Mc Graw-Hill Education, 2004.
2. J.B.Gupta, "Measurements and Instrumentation", S K Kataria & Sons, Delhi, 2003.
3. Oliver and Cage, " Electronic Measurements and Instrumentation ", McGraw Hill, 1975.
4. <https://www.nptel.ac.in>

|  |  |  |   |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |   |  |
|--|--|--|---|-----------------------------|---|--------------------|---|------------------------|----------|--------------------|----------|-------------------------|---|--------------------|--|---|--|
| <b>BEC4L1</b>  | <b>ELECTRONIC CIRCUIT DESIGN LAB</b>                                     |  |   |                             |   |                    |   | <b>L</b>               | <b>T</b> | <b>P</b>           | <b>C</b> |                         |   |                    |  |   |  |
|  | Total Contact Hours - 45   |  |   |                             |   |                    |   | 0                      | 0        | 3                  | 2        |                         |   |                    |  |   |  |
|  | Prerequisite –Electronics Devices and circuit Lab                        |  |   |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |   |  |
|  | Course Designed by – Dept. of Electronics And Communication Engineering. |  |   |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |   |  |
| <b>OBJECTIVES</b>  |  |  |   |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |   |  |
| <ul style="list-style-type: none"> <li>To gain hands on experience in designing electronic circuits.</li> <li>To learn simulation software used in circuit design.</li> <li>To learn the fundamental principles of amplifier ,Oscillator and multivibrator circuits</li> <li>Construct waveform generation circuits</li> </ul> |  |  |   |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |   |  |
| <b>COURSE OUTCOMES (COs)</b>   |  |  |   |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |   |  |
| CO1  | Analyse the characteristics of amplifiers.                               |  |   |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |   |  |
| CO2  | Analyse the characteristics of Oscillators.                              |  |   |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |   |  |
| CO3  | Analyse the characteristics of Multivibrators                            |  |   |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |   |  |
| CO4  | Analyse the characteristics of tuned amplifiers                          |  |   |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |   |  |
| CO5  | Analyse the frequency response of amplifiers using pSpice                |  |   |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |   |  |
| CO6  | Model the design of electronic circuits using PSpice                     |  |   |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |   |  |
| 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 |                    | M |                        |          | M                  |          |                         | M |                    |  |   |  |
|  | CO2  | H  | M | H                           | H |                    | M |                        | M        | M                  | L        |                         |   |                    |  |   |  |
|  | CO3  | M  | M |                             | H |                    |   |                        |          |                    |          |                         |   |                    |  |   |  |
|  | CO4  | M  |   |                             | H |                    |   | M                      |          |                    |          |                         |   |                    |  |   |  |
|  | CO5  |  |   | M                           |   | H                  |   |                        |          |                    |          |                         |   |                    |  |   |  |
|  | CO6  | L  | H | H                           |   | H                  | H |                        | 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 |   |                             |   |                    |   |                        |          |                    |          |                         |   |                    |  |   |  |

### LIST OF EXPERIMENTS

- 1.Feedback amplifier
2. Transistor phase shift oscillator
3. Class A single tuned amplifier
4. LC Oscillators
5. Collector coupled and Emitter coupled Astable multivibrator
6. Wein bridge oscillator
7. Schmitt Trigger
8. **Emitter coupled bistable multivibrator**

9. Monostable multivibrator
10. Class C tuned amplifier

**SIMULATION USING SPICE:**

1. Frequency response of CE amplifier with Emitter resistance.
2. DC response of CS amplifier
3. Frequency response of Cascode amplifier.
4. Transfer Characteristics of Class B Power Amplifier

**Experiments beyond the syllabus should be conducted.**

|   |   |  |                             |                    |                         |   |   |                    |                         |                    |                                   |   |   |
|---|---|--|-----------------------------|--------------------|-------------------------|---|---|--------------------|-------------------------|--------------------|-----------------------------------|---|---|
| <b>BEC4L2</b>   | <b>LINEAR INTEGRATED CIRCUITS LAB</b>                                   |  |                             |                    |                         |   |   | <b>L</b>           | <b>T</b>                | <b>P</b>           | <b>C</b>                          |   |   |
|   | Total Contact Hours - 45  |  |                             |                    |                         |   |   | 0                  | 0                       | 3                  | 2                                 |   |   |
|   | Prerequisite – Basic Electronics Lab                                    |  |                             |                    |                         |   |   |                    |                         |                    |                                   |   |   |
|   | Course Designed by – Dept. of Electronics And Communication Engineering |  |                             |                    |                         |   |   |                    |                         |                    |                                   |   |   |
| <b>OBJECTIVES</b>   |   |  |                             |                    |                         |   |   |                    |                         |                    |                                   |   |   |
| <ul style="list-style-type: none"> <li>• To apply operational amplifiers in linear and nonlinear applications.</li> <li>• To acquire the basic knowledge of special function ICs</li> <li>• To use SPICE software for circuit design</li> </ul> |   |  |                             |                    |                         |   |   |                    |                         |                    |                                   |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |   |  |                             |                    |                         |   |   |                    |                         |                    |                                   |   |   |
| CO1   | Design and analyse the various linear application of op-amp             |  |                             |                    |                         |   |   |                    |                         |                    |                                   |   |   |
| CO2   | Design and analyse the various non-linear application of op-amp         |  |                             |                    |                         |   |   |                    |                         |                    |                                   |   |   |
| CO3   | Design and analyse filter circuits using op-amp                         |  |                             |                    |                         |   |   |                    |                         |                    |                                   |   |   |
| CO4   | Design and analyse oscillators and multivibrator circuits using op-amp  |  |                             |                    |                         |   |   |                    |                         |                    |                                   |   |   |
| CO5   | Design and analyse the various application of 555 timer                 |  |                             |                    |                         |   |   |                    |                         |                    |                                   |   |   |
| CO6   | Analyse the performance of oscillators and multivibrators using SPICE   |  |                             |                    |                         |   |   |                    |                         |                    |                                   |   |   |
| 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                       |   | M |                    | L                       |                    |                                   |   |   |
|   | CO2   | H  |                             | H                  | H                       |   |   |                    |                         | M                  | L                                 |   |   |
|   | CO3   | M  | M                           | M                  | H                       | M |   |                    | H                       | M                  | M                                 |   | M |
|   | CO4   | M  |                             | M                  | H                       |   |   |                    |                         | M                  |                                   |   |   |
|   | CO5   | M  |                             | M                  | H                       |   |   |                    |                         | H                  |                                   |   |   |
|   | CO6   | H  | M                           | M                  | H                       | M |   |                    |                         |                    | H                                 | M |   |
| 3   | Category  | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Engg Sciences (ES) | Professiona I Core (PC) |   |   | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/ Seminar/ Internship (PR) |   |   |
|   |   |  |                             |                    |                         |   |   | √                  |                         |                    |                                   |   |   |
| 4   | Approval  | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                         |   |   |                    |                         |                    |                                   |   |   |

**LIST OF EXPERIMENTS**

1. Inverting and non-inverting amplifier
2. Integrator , differentiator

3. Summer, subtractor using op-amp
4. Triangular wave generator using op-amp
5. RC Phase shift Oscillator using op-amp
6. Schmitt trigger using Op-amp
7. Active low pass and high pass filters.
8. Astable Multivibrator using 555 timer
9. Monostable multivibrator using 555 timer
10. Schmitt trigger using 555 timer
11. Voltage controlled Oscillator.
12. PLL characteristics.
13. Study of SMPS.

### **SIMULATION USING SPICE**

1. Simulation of Experiments, 4, 5, 6, 7 and 8..
2. CMOS Inverter, NAND and NOR

**Experiments beyond the syllabus should be conducted.**

|  |  |   |   |   |   |   |          |          |          |          |   |   |   |
|--|--|---|---|---|---|---|----------|----------|----------|----------|---|---|---|
| <b>BCS4L3</b>  | <b>OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURES LAB</b>                                     |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |   |
|  | Total Contact Hours - 45   |   |   |   |   |   | 0        | 0        | 3        | 2        |   |   |   |
|  | Prerequisite – Computer Practice Lab   |   |   |   |   |   |          |          |          |          |   |   |   |
|  | Course Designed by – Dept. of Computer Science Engineering                                     |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>OBJECTIVES</b>  |  |   |   |   |   |   |          |          |          |          |   |   |   |
| <ul style="list-style-type: none"> <li>• To learn various object oriented concepts through simple programs.</li> <li>• To understand the concepts of searching and sorting algorithms</li> </ul> |  |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>   |  |   |   |   |   |   |          |          |          |          |   |   |   |
| CO1  | Implement various object oriented concepts through simple programs                             |   |   |   |   |   |          |          |          |          |   |   |   |
| CO2  | Implement different data structures using C++.   |   |   |   |   |   |          |          |          |          |   |   |   |
| CO3  | Apply the different data structures for implementing solutions to practical problems.          |   |   |   |   |   |          |          |          |          |   |   |   |
| CO4  | Demonstrate searching algorithms   |   |   |   |   |   |          |          |          |          |   |   |   |
| CO5  | Demonstrate sorting algorithms   |   |   |   |   |   |          |          |          |          |   |   |   |
| CO6  | To develop the skills in programming using C++ which forms the basics for advanced 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 |   |   |   | M        |          | L        |          |   |   |   |
|  | CO2  |   |   |   | M | M |          |          |          | M        | M |   |   |
|  | CO3  |   | M |   | M | M |          | M        |          | M        | M |   | M |
|  | CO4  | M | M | M |   |   |          |          |          | M        |   |   | H |
|  | CO5  | M |   | M |   |   |          |          |          | H        |   |   | H |
|  | CO6  | H | H | M |   | M |          | H        |          | H        | M |   | M |

|   |          |  |                     |                    |                        |                    |                         |                    |   |
|---|----------|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences (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

### Programs for C++ Concepts

- Constructors and destructors
- Static data member
- Function overloading
- Operator overloading
- Inheritance

### Data Structures

#### 1. List

- Array implementation
- Linked list implementation
- Polynomial operations

#### 2. Stack

- Array implementation
- Linked list implementation
- Applications

#### 3. Queue

- Array implementation
- Linked list implementation

#### 4. Binary Search tree

#### 5. Sorting

- Quick sort
- Merge sort

#### 6. Searching

- Linear search
- Binary search

**Experiments beyond the syllabus should be conducted.**

|        |                                    |          |          |          |          |
|--------|------------------------------------|----------|----------|----------|----------|
| BEC505 | <b>DIGITAL SIGNAL PROCESSING</b>   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|        | Total Contact Hours - 60           | 4        | 0        | 0        | 4        |
|        | Prerequisite – Signals and Systems |          |          |          |          |

|   |   |  |                     |                    |                   |                    |                          |               |  |   |   |   |   |
|---|---|--|---------------------|--------------------|-------------------|--------------------|--------------------------|---------------|--|---|---|---|---|
| Course Designed by – Dept. of Electronics And Communication Engineering.  |   |  |                     |                    |                   |                    |                          |               |  |   |   |   |   |
| <b>OBJECTIVES:</b>  |   |  |                     |                    |                   |                    |                          |               |  |   |   |   |   |
| <ul style="list-style-type: none"> <li>To study about discrete time systems and to learn about FFT algorithms.</li> <li>To study the design techniques for FIR and IIR digital filters</li> <li>To study the finite word length effects in signal processing</li> <li>To study the properties of random signal, Multirate digital signal processing and about QMF filters.</li> </ul> |   |  |                     |                    |                   |                    |                          |               |  |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |   |  |                     |                    |                   |                    |                          |               |  |   |   |   |   |
| CO1   | To apply DFT for the analysis of digital signals & systems  |  |                     |                    |                   |                    |                          |               |  |   |   |   |   |
| CO2   | To design FIR filters   |  |                     |                    |                   |                    |                          |               |  |   |   |   |   |
| CO3   | To design IIR filters   |  |                     |                    |                   |                    |                          |               |  |   |   |   |   |
| CO4   | To characterize finite Word length effect on filters  |  |                     |                    |                   |                    |                          |               |  |   |   |   |   |
| CO5   | To have a deep understanding on basics of digital signal processing which can be applied to communication systems |  |                     |                    |                   |                    |                          |               |  |   |   |   |   |
| CO6   | To design the Multirate Filters   |  |                     |                    |                   |                    |                          |               |  |   |   |   |   |
| 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                  | H                 | H                  |                          |               |  | M |   |   | H |
|   | CO3   | H  | H                   | H                  | H                 | H                  |                          |               |  | M |   |   | H |
|   | CO4   |  | M                   |                    | M                 |                    | H                        |               |  | M |   |   |   |
|   | CO5   | M  |                     |                    |                   |                    |                          |               |  |   | M |   | H |
|   | CO6   |  |                     | H                  |                   |                    | L                        |               |  |   |   |   |   |
| 3   | Category  | Humanities & Social Studies (HS)                               | Basic Sciences (BS) | Engg Sciences (ES) | Professional Core | Core Elective (CE) | Non-Major Elective (NIE) | Open Elective | Project/Term Paper/Seminar/Internship (PR) |   |   |   |   |
|   |   |  |                     |                    | √                 |                    |                          |               |  |   |   |   |   |
| 4   | Approval  | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                     |                    |                   |                    |                          |               |  |   |   |   |   |

### UNIT I DISCRETE – TIME SIGNALS AND SYSTEMS

12

Sampling of Analogue signals – aliasing – standard discrete time signals – classification – discrete time systems – Linear time invariant stable casual discrete time systems – classification methods – linear and circular convolution – Overlap add and Save methods-Difference equation representation – DFS, DTFT, DFT – FFT computations using DIT and DIF algorithms.

### UNIT II INFINITE IMPULSE RESPONSE DIGITAL FILTERS

12

Review of design of analogue Butterworth and Chebyshev Filters, Frequency transformation in analogue domain – Design of IIR digital filters using impulse invariance technique – Design of

digital filters using bilinear transform – pre warping – Frequency transformation in digital domain – Realization using direct, cascade and parallel forms.

**UNIT III FINITE IMPULSE RESPONSE DIGITAL FILTERS: 12**

Symmetric and Antisymmetric FIR filters – Linear phase FIR filters – Design using Frequency sampling technique – Window design using Hamming, Hanning and Blackmann Windows – Concept of optimum equiripple approximation – Realisation of FIR filters – Transversal, Linear phase and Polyphase realization structures.

**UNIT IV FINITE WORD LENGTH EFFECTS: 12**

Quantization noise – derivation for quantization noise power – Fixed point and binary floating point number representations – Comparison – Overflow error – truncation error – coefficient quantization error – limit cycle oscillations- signal scaling – analytical model of sample and hold operations.

**UNIT V SPECIAL TOPICS IN DSP: 12**

Discrete Random Signals- Mean, Variance, Co-variance and PSD – Periodiogram Computation – Principle of Multi rate DSP – decimation and Interpolation by integer factors – Time and frequency domain descriptions – Single, Multi stage, polyphase structures – QMF filters – Subband Coding

**TEXT BOOKS:**

1. John G.Proakis&DimitrisG.Manolakis,“Digital Signal Processing–Principles, Algorithms & Applications”, Fourth Edition, Pearson Education/Prentice Hall,2007.

**REFERENCE BOOKS:**

- 1.Sanjit K.Mitra,“Digital Signal Processing–A Computer Based Approach”,Tata McGraw Hill,
2. A.V.Oppenheim, R.W. Schafer andJ.R. Buck, “Discrete-Time Signal Processing”, 8<sup>th</sup> IndianReprint,Pearson,2004.
- 3.www.ocw.mit.edu

|  |   |          |          |          |          |
|--|---|----------|----------|----------|----------|
| <b>BEC502</b>  | <b>MICROPROCESSOR AND MICROCONTROLLER</b>                               | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|  | Total Contact Hours - 45  | 4        | 0        | 0        | 4        |
|  | Prerequisite –Principles of Digital Electronics                         |          |          |          |          |
|  | Course Designed by – Dept. of Electronics and Communication Engineering |          |          |          |          |
| <b>OBJECTIVES</b>  |   |          |          |          |          |
| <ul style="list-style-type: none"> <li>• The objective of this course is to become familiar with the architecture and the instruction set of an Intel microprocessor</li> <li>• Assembly language programming will be studied as well as the design of various types of digital and analog interfaces</li> <li>• Understand the architecture of 8085 and 8051</li> </ul> |   |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>   |   |          |          |          |          |
| CO1  | Design and implement programs on 8086,ARM, PIC.                         |          |          |          |          |
| CO2  | DesignI/O circuits.   |          |          |          |          |

|   |   |  |                     |                    |                        |                    |                         |                    |  |   |   |   |   |
|---|---|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|--|---|---|---|---|
| CO3   | The program prepares students to successfully compete for employment in Electronics, Manufacturing and Embedded fields. |  |                     |                    |                        |                    |                         |                    |  |   |   |   |   |
| CO4   | Design Memory Interfacing circuits.   |  |                     |                    |                        |                    |                         |                    |  |   |   |   |   |
| CO5   | Design and implement 8051 microcontroller based systems.  |  |                     |                    |                        |                    |                         |                    |  |   |   |   |   |
| CO6   | Describethe architectureand instruction setof ARM microcontroller   |  |                     |                    |                        |                    |                         |                    |  |   |   |   |   |
| 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                      |                    | M                       |                    |  | H | M |   | H |
|   | CO2   | M  | L                   | H                  |                        | M                  |                         |                    |  | L |   |   |   |
|   | CO3   | M  |                     |                    |                        |                    |                         |                    |  |   |   |   | M |
|   | CO4   | M  |                     |                    | H                      | H                  |                         |                    |  | M | M |   |   |
|   | CO5   | M  | H                   |                    |                        | H                  |                         |                    |  | M |   |   | H |
|   | CO6   |  |                     |                    |                        | M                  | H                       |                    |  |   |   |   |   |
| 3   | Category  | Humanities & Social Studies (HS)                               | Basic Sciences (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 MICROPROCESSOR 8086

12

Register Organization -Architecture-Signals-Memory Organization-Bus Operation-I/O Addressing-Minimum Mode-Maximum Mode-Timing Diagram-Interrupts - Service Routines – I/O and Memory Interfacing concepts.

### UNIT II PROGRAMMING OF 8086

12

Addressing Modes-Instruction format-Instruction set-Assembly language programs in 8086. RISC architecture – introduction to ARM Programming register configuration and instruction set - introduction to PIC Programming register configuration and instruction set – sample program.

### UNIT III INTERFACING DEVICES

12

Programmable Peripheral Interface (8255) - Programmable Interval Timer (8254) - Programmable Interrupt Controller (8259A) - Programmable DMA Controller (8257) - Programmable Communication Interface (8251A) – Programmable Keyboard and Display Controller (8279).

### UNIT IV MICROCONTROLLER-8051

12

Register Set-Architecture of 8051 microcontroller- I/O and memory addressing-Interrupts-Instruction set- Addressing modes. Timer-Serial Communication-Interrupts Programming-Interfacing to External Memory-Interfacing to ADC, LCD, DAC, Keyboard and stepper motor.

## UNIT V SYSTEM DESIGN USING MICROPROCESSOR & MICROCONTROLLER

12

Case studies – Traffic light control, washing machine control, RTC Interfacing using I2C Standard- Motor Control- Relay, PWM, DC & Stepper Motor.

### TEXT BOOKS:

1. Muhammad Ali Mazidi and Janice Gillispie Mazidi, "The 8051 -Microcontroller and Embedded systems", 7th Edition, Pearson Education, 2004.
2. Douglas.V.Hall, "Microprocessor and Interfacing : Programming and Hardware", Revised 2nd edition, McGraw Hill, 1992
3. Steve Furber, "ARM System On Chip Architecture", Second Edition, Pearson Education, 2000.
4. K. Ray and K. M. Bhurchandi, "Advanced Microprocessors and Peripherals – Architectures, Programming and Interfacing", Tata McGraw Hill, 2002 Reprint
5. Design with PIC microcontroller by John B Peatman.

### REFERENCE BOOKS:

1. Kenneth.J.Ayala, "8051 Microcontroller Architecture, Programming and Applications", 3<sup>rd</sup> edition, Thomson, 2007.
2. NuvoTon Cortex M0 (Nu-LB-NUC100/140) Driver and Processor Reference Manual;
3. [www.nuvoton.com](http://www.nuvoton.com)

| BEC504   | COMMUNICATION ENGINEERING I  | L | T | P | C |
|--|--|---|---|---|---|
|  | Total Contact Hours - 45   | 3 | 0 | 0 | 3 |
|  | Prerequisite –Signals and Systems  |   |   |   |   |
|  | Course Designed by – Dept. of Electronics And Communication Engineering  |   |   |   |   |
| <b>OBJECTIVES</b>  |  |   |   |   |   |
| <ul style="list-style-type: none"> <li>• Analog modulation and demodulation techniques.</li> <li>• Acquiring mathematical understanding of Analog Communication Systems.</li> <li>• Understanding the trade-offs (in terms of bandwidth, power, and complexity requirements)</li> <li>• Performance evaluation of communication systems in the presence of noise.</li> </ul> |  |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>   |  |   |   |   |   |
| CO1  | Students will have knowledge of basic mathematical concepts and from a block-diagram system approach.          |   |   |   |   |
| CO2  | It will allow thinking in the two “domains” of communications, the time domain and the frequency domain.       |   |   |   |   |
| CO3  | To evaluate communication systems in the presence of noise.  |   |   |   |   |
| CO4  | They will have knowledge of basic types of analog modulation (AM, FM, and PM) from mathematical description.   |   |   |   |   |
| CO5  | Tounderstand trade-offs (in terms of bandwidth, power, and complexity requirements)                            |   |   |   |   |
| CO6  | Design of practical communication system at the block diagram level under certain constraints and requirements |   |   |   |   |
| 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 |                         | M |                    |  |   |  |
|   | CO2      | M  | M |                     |   |                    |   | M                      |   | M                  |   |                         |   |                    |  |   |  |
|   | CO3      | M  | M |                     | H | M                  | L |                        |   | M                  | L |                         |   |                    |  |   |  |
|   | CO4      | M  |   | M                   |   | H                  |   |                        |   |                    | M |                         | M |                    |  |   |  |
|   | CO5      |  | M |                     | M |                    | M |                        |   | H                  |   |                         | M |                    |  |   |  |
|   | CO6      | H  | M |                     | M | M                  |   | M                      |   | M                  |   |                         |   |                    |  |   |  |
| 3 | Category | Humanities & Social Studies (HS)                               |   | Basic Sciences (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 AMPLITUDE MODULATION SYSTEMS

9

Need for modulation, Amplitude Modulation System, Single Tone & Multiple Tone Amplitude Modulation, Power Relation, Generation of Amplitude Modulation – Linear Modulation – Collector Modulation method Non-linear Modulation – Square law Modulator, Product Modulator, Switching Modulator - Demodulation of Amplitude Modulation – Envelope Detector, Coherent Detector, VSB, Performance comparison of various Amplitude Modulation System.

### UNIT II ANGLE MODULATION SYSTEMS

9

Frequency Modulation, Types of Frequency Modulation, Generation of NBFM, WBFM, Transmission BW of FM Signal, Phase Modulation. Relationship between PM & FM, Comparison, Generation of FM Direct Method, Indirect method, Demodulation of FM - FM Discriminators.

### UNIT III RADIO RECEIVERS

9

Introduction – Functions & Classification of Radio Receivers, Tuned Radio Frequency (TRF) Receiver, Superheterodyne Receiver – Basic Elements, Receiver Characteristics, Frequency Mixers, AGC Characteristics

### UNIT IV NOISE THEORY

9

Noise, Types of noise, White Noise, Addition of Noise due to several sources in series and parallel, Generalized Nyquist Theorem for Thermal Noise, Calculation of Thermal Noise for a Single Noise Source, RC Circuits & Multiple Noise sources. Equivalent Noise Bandwidth, Signal to Noise Ratio, Noise-Figure, Noise Temperature, Calculation of Noise Figure, Noise Figure Determination for Cascaded Stages of Amplifiers

## UNIT V PERFORMANCE OF COMMUNICATION SYSTEM

9

Receiver Model, Noise in DSB-SC Receivers, Noise in SSB-SC Receivers, Noise in AM receiver (Using Envelope Detection), Noise in FM Receivers, FM Threshold Effect, Threshold Improvement through Pre-Emphasis and De-Emphasis, Noise in PM system – Comparison of Noise performance in PM and FM, Link budget analysis for radio channels.

### TEXT BOOKS:

1. John G. Proakis & Masoud Salehi, “Communication System Engineering”, 2nd Edition, 2002.
2. R.P. Singh & S.D. Sapre, “Communication Systems: Analog & Digital”, 3rd Edition, Tata McGraw-Hill, 2012.

### REFERENCE BOOKS:

1. Sanjay Sharma, “Communication Systems, Analog & Digital”, S.K. Kataria & Sons, 5th Edition, 2009.
2. Dennis Reddy & John Coolen, “Electronic Communications”, 4th Edition, Prentice Hall, 2008.
3. www.techvyom.com

| <b>BMA504</b>  |   | <b>RANDOM PROCESS</b>                     |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |
|--|---|---|---|---|---|---|---|----------|----------|----------|----------|---|---|
|  |   | Total Contact Hours - 75                  |   |   |   |   |   | 3        | 2        | 0        | 4        |   |   |
|  |   | Prerequisite –Probability theory.         |   |   |   |   |   |          |          |          |          |   |   |
|  |   | Course Designed by – Dept. of Mathematics |   |   |   |   |   |          |          |          |          |   |   |
| <b>OBJECTIVES</b>  |   |   |   |   |   |   |   |          |          |          |          |   |   |
| <ul style="list-style-type: none"> <li>• To impart adequate knowledge about probability concepts,</li> <li>• To make students understand Moment Generating Functions.</li> </ul> |   |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>COURSE OUTCOMES (COs)</b>   |   |   |   |   |   |   |   |          |          |          |          |   |   |
| CO1  | After completing this course students would be able to apply concepts of Probability to solve problems in Electronic Engineering.         |   |   |   |   |   |   |          |          |          |          |   |   |
| CO2  | Find functional relationship between random inputs and outputs with the use of Random Process Techniques                                  |   |   |   |   |   |   |          |          |          |          |   |   |
| CO3  | Find the linearity in Birth and Death Processes with the use of Poisson processes.  |   |   |   |   |   |   |          |          |          |          |   |   |
| CO4  | To make students understand Discrete and Continuous Random variables, Random Processes and their applications in Electronic Transmissions |   |   |   |   |   |   |          |          |          |          |   |   |
| CO5  | To Understand about the correlation Functions   |   |   |   |   |   |   |          |          |          |          |   |   |
| CO6  | Find the trend information from discrete data set through numerical differentiation and summary information through random process        |   |   |   |   |   |   |          |          |          |          |   |   |
| 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        | H        |          | H |   |
|  | CO2   | H   | M | H |   |   |   |          |          |          |          |   | M |
|  | CO3   | H   |   |   | H | M | M |          |          |          | L        |   |   |
|  | CO4   | H   |   | M |   | H |   | M        | L        |          |          | M |   |
|  | CO5   | H   | M |   | M |   |   | H        |          |          | M        |   | H |
|  | CO6   | H   | M |   |   | M | H |          |          |          | M        | M |   |

|   |          |  |                     |                    |                        |                    |                         |                    |   |
|---|----------|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences (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 PROBABILITY AND RANDOM VARIABLES

9+6

Probability concepts, Bayes' theorem, Random variables. Moments, Moment Generating function, Binomial, Poisson, Geometric, Exponential, and Normal distributions. **Univariate Transformation of random variable.**

### UNIT II TWO-DIMENSIONAL RANDOM VARIABLES

9+6

Marginal and conditional distributions, Covariance, Correlation and regression, Transformation of random variables, Central limit theorem-Lindberg and Liapounouff Theorems (applications).

### UNIT III RANDOM PROCESSES

9+6

Classification, Stationary and Markov processes, Binomial process, Poisson process, Sine-wave process, Ergodic processes.

### UNIT IV CORRELATION FUNCTION

9+6

Auto correlation for discrete and continuous processes, Cross correlation functions, **Correlation integrals.**

### UNIT V SPECTRAL DENSITIES

9+6

Power spectral density, Cross spectral density, Applications to linear systems with random inputs

### TEXT BOOKS:

1. S.C.Gupta & V.K.Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, New Delhi , 2003.
2. O Flynn M., " Probability, Random Variables and Random Processes", HarperandRowPublishers, New York, (1982).

### REFERENCE BOOKS:

1. Peebles Jr., "Probability, Random Variables and Random Signal Principles", McGraw Hill Publishers, (1987).
2. Ochi M.K., "Applied Probability and Stochastic Processes ", Wiley India Pvt Ltd, New Delhi.
3. Douglas C.Montgomery, George C.Runger, and Norma F.Hubele. "Engineering Statistics" 4<sup>th</sup> Edn. Wiley India Pvt Ltd., New Delhi. 2007.
4. Ronald E.Walpole. "Probability and Statistics for Engineers and Scientists". 9<sup>th</sup> Edn. 2014.
5. Pearson Education, Chennai-600113
6. www.math.chalmers.se/Stat/.../CTH/.../091

|   |   |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
|---|---|--|---|---------------------|---|--------------------|----------|------------------------|----------|--------------------|---|-------------------------|---|--------------------|--|---|--|
| <b>BEC5L1</b>   | <b>DIGITAL SIGNAL PROCESSING LABORATORY</b>   |  |   |                     |   | <b>L</b>           | <b>T</b> | <b>P</b>               | <b>C</b> |                    |   |                         |   |                    |  |   |  |
|   | Total Contact Hours - 45  |  |   |                     |   | 0                  | 0        | 3                      | 2        |                    |   |                         |   |                    |  |   |  |
|   | Prerequisite – Object Oriented Programming & data Structures Lab                      |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
|   | Course Designed by – Dept. of. Electronics And Communication Engineering              |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| <b>OBJECTIVES</b> - To implement Linear and Circular Convolution<br>- To implement FIR and IIR filters<br>- To study the architecture of DSP processor. |   |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| <b>COURSE OUTCOMES (COs)</b>  |   |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| CO1   | Experiment concepts of DSP and its applications using MATLAB Software                 |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| CO2   | To understand about the basic signal generation                                       |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| CO3   | To learn Fourier Transform Concepts   |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| CO4   | To design FIR filters   |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| CO5   | To design IIR filters.  |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| CO6   | Demonstrate their abilities towards DSP processor based implementation of DSP systems |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| 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 | H                  | M        |                        |          | M                  |   |                         |   |                    |  |   |  |
|   | CO2   | L  |   | M                   |   | H                  |          | M                      |          |                    |   |                         | M |                    |  |   |  |
|   | CO3   | M  |   |                     |   | H                  |          | M                      |          | M                  | M |                         |   |                    |  |   |  |
|   | CO4   | M  | M | M                   |   | H                  |          | M                      |          | M                  | M |                         | H |                    |  |   |  |
|   | CO5   | M  | M | M                   |   | H                  |          |                        |          | M                  |   |                         | H |                    |  |   |  |
|   | CO6   | L  |   |                     | M |                    |          |                        |          |                    | H |                         |   |                    |  |   |  |
| 3   | Category  | Humanities & Social Studies (HS)                               |   | Basic Sciences (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. **Waveform generation**
2. Sampling and its effect on aliasing
3. Linear and circular convolution
4. DFT computation
5. Fast Fourier transforms
6. FIR Filters Implementation
7. IIR Filters Implementation
8. Quantisation Noise.
9. Multirate Signal Processing

10.DSP processor implementation.

**Experiments beyond the syllabus should be conducted.**

|   |   |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |                                   |  |
|---|---|--|---|---------------------|---|--------------------|----------|------------------------|----------|--------------------|---|-------------------------|---|--------------------|--|-----------------------------------|--|
| <b>BEC5L6</b>   | <b>MICROPROCESSOR AND MICROCONTROLLER LAB</b>                           |  |   |                     |   |                    | <b>L</b> | <b>T</b>               | <b>P</b> | <b>C</b>           |   |                         |   |                    |  |                                   |  |
|   | Total Contact Hours - 45  |  |   |                     |   |                    | 0        | 0                      | 3        | 2                  |   |                         |   |                    |  |                                   |  |
|   | Prerequisite – Principles of Digital Electronics                        |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |                                   |  |
|   | Course Designed by – Dept. of Electronics And Communication Engineering |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |                                   |  |
| <b>OBJECTIVES</b>   |   |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |                                   |  |
| <ul style="list-style-type: none"> <li>• Study the Architecture of 8085&amp;8086 microprocessor.</li> <li>• Learn the design aspects of I/O and Memory Interfacing circuits.</li> <li>• Study the Architecture of 8051 microcontroller</li> </ul> |   |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |                                   |  |
| <b>COURSE OUTCOMES (COs)</b>  |   |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |                                   |  |
| CO1   | Design and implement programs on 8085 microprocessor.                   |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |                                   |  |
| CO2   | Design and implement programs on 8086 microprocessor.                   |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |                                   |  |
| CO3   | Design interfacing circuits with 8085                                   |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |                                   |  |
| CO4   | Design interfacing circuits with 8086.                                  |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |                                   |  |
| CO5   | Design and implement 8051 microcontroller based systems                 |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |                                   |  |
| CO6   | To Understand the concepts related to I/O and memory interfacing        |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |                                   |  |
| 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        |                        | L        | H                  | L |                         |   |                    |  |                                   |  |
|   | CO2   | H  |   |                     | M |                    |          | M                      |          |                    |   |                         | M |                    |  |                                   |  |
|   | CO3   | M  | M | M                   | H |                    |          | M                      |          | M                  |   |                         |   |                    |  |                                   |  |
|   | CO4   | M  | M | M                   | H |                    |          |                        | H        |                    | M |                         |   |                    |  |                                   |  |
|   | CO5   | M  | H | H                   |   | H                  |          |                        |          | H                  |   |                         | H |                    |  |                                   |  |
|   | CO6   |  |   | M                   |   |                    |          | M                      |          |                    |   |                         |   |                    |  |                                   |  |
| 3   | Category  | Humanities & Social Studies (HS)                               |   | Basic Sciences (BS) |   | Engg Sciences (ES) |          | Professional Core (PC) |          | Core Elective (CE) |   | Non-Major Elective (NE) |   | Open Elective (OE) |  | Project/ Seminar/ Internship (PR) |  |
|   |   |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |                                   |  |
| 4   | Approval  | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |                                   |  |

### LIST OF EXPERIMENTS

1. Programming with 8085 – 8-bit/16-bit addition/subtraction
2. Programming with 8085 – 8-bit/16-bit multiplication/ division using repeated addition/subtraction.

3. Programming with 8085 – 8-bit/16-bit Ascending/Descending order
4. Programming with 8085 – 8-bit/16-bit Largest/smallest number
5. Programming with 8085- code conversion, decimal arithmetic, bit manipulations.
6. Programming with 8085 – matrix multiplication, floating point operations.
7. Programming with 8086 – String manipulation, search, find and replace, copy operations, sorting.
8. Interfacing with 8085/8086 – 8255, 8253.
9. Interfacing with 8085/8086 – 8279, 8251.
10. 8051 Microcontroller based experiments – Simple assembly language programs
11. 8051 Microcontroller based experiments – simple control applications.

**Experiments beyond the syllabus should be conducted.**

|   |  |   |   |   |   |   |          |          |          |          |   |   |   |
|---|--|---|---|---|---|---|----------|----------|----------|----------|---|---|---|
| <b>BEC5L3</b>   | <b>COMMUNICATION ENGINEERING<br/>LABORATORY-I</b>  |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |   |
|   | Total Contact Hours - 45   |   |   |   |   |   | 0        | 0        | 3        | 2        |   |   |   |
|   | Prerequisite –Communication Engineering-I  |   |   |   |   |   |          |          |          |          |   |   |   |
|   | Course Designed by – Dept. of Electronics And Communication Engineering  |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>OBJECTIVES</b>   |  |   |   |   |   |   |          |          |          |          |   |   |   |
| <ul style="list-style-type: none"> <li>• To practice the basic theories of analog communication system.</li> <li>• To use computer simulation tools such as P-SPICE, or Matlab to carry out design experiments as it is a key analysis tool of engineering design.</li> <li>• To give a specific design problem to the students, which after completion they will verify using the simulation software or hardware implementation.</li> </ul> |  |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |  |   |   |   |   |   |          |          |          |          |   |   |   |
| CO1   | To develop practical knowledge about theories of analog communication  |   |   |   |   |   |          |          |          |          |   |   |   |
| CO2   | To develop practical knowledge about simulation software   |   |   |   |   |   |          |          |          |          |   |   |   |
| CO3   | To provide hands-on experience to the students, so that they are able to apply theoretical concepts in practice. |   |   |   |   |   |          |          |          |          |   |   |   |
| CO4   | Demonstrate various pulse modulation techniques  |   |   |   |   |   |          |          |          |          |   |   |   |
| CO5   | Evaluate analog modulated waveform in time /frequency domain and also find modulation index                      |   |   |   |   |   |          |          |          |          |   |   |   |
| CO6   | Develop understanding about performance of analog communication systems  |   |   |   |   |   |          |          |          |          |   |   |   |
| 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        | M        |   | L |   |
|   | CO2  | M |   |   |   |   |          |          |          |          |   |   |   |
|   | CO3  | M | M | M | H |   |          |          |          |          | L |   | H |
|   | CO4  | M | M | M |   | H |          | M        |          | H        |   | H |   |
|   | CO5  |   | L | M |   |   |          |          |          | M        |   |   |   |
|   | CO6  | M |   |   |   |   |          | H        |          |          |   | H |   |

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

### LIST OF EXPERIMENTS

1. AM modulator and Demodulator.
2. DSB-SC modulator and Demodulator.
3. SSB modulator and Demodulator.
4. FM modulator and Demodulator.
5. PAM modulator and Demodulator.
6. TDM Multiplexer and Demultiplexer.
7. FDM Multiplexer and Demultiplexer.
8. Pre emphasis and De-emphasis in FM.
9. Simulation experiments using P-SPICE and Matlab.
  - i) AM modulator with AWGN noise in Matlab.
  - ii) Pre-emphasis and De-emphasis in FM using P-SPICE.

### RESOURCES REQUIRED

1. AM Kit
2. TDM Kit

**Experiments beyond the syllabus should be conducted.**

|   |   | <b>COMPREHENSION I</b> |          |          |          |
|---|---|------------------------|----------|----------|----------|
|   |   | <b>L</b>               | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>BEC5C1</b>   | 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. Electronics & Communication Engineering      |                        |          |          |          |
| <b>OBJECTIVES</b>   |   |                        |          |          |          |
| <ul style="list-style-type: none"> <li>• To provide a complete review of Electrical &amp; Electronics 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> |   |                        |          |          |          |

|  |  |  |                     |                    |                        |                    |                         |                    |                             |          |   |   |   |
|--|--|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|-----------------------------|----------|---|---|---|
| <b>BEC601</b>  | <b>COMPUTER COMMUNICATION AND NETWORKS</b>   |  |                     |                    |                        |                    | <b>L</b>                | <b>T</b>           | <b>P</b>                    | <b>C</b> |   |   |   |
|  | Total Contact Hours - 45   |  |                     |                    |                        |                    | 3                       | 0                  | 0                           | 3        |   |   |   |
|  | Prerequisite –Communication Engineering-II   |  |                     |                    |                        |                    |                         |                    |                             |          |   |   |   |
|  | Course Designed by – Dept. of Electronics And Communication Engineering.             |  |                     |                    |                        |                    |                         |                    |                             |          |   |   |   |
| <b>OBJECTIVES</b>  |  |  |                     |                    |                        |                    |                         |                    |                             |          |   |   |   |
| <ul style="list-style-type: none"> <li>To make the students to understand the different layers of ISO /OSI model and TCP/IP Network IEEE standards.</li> <li>To understand IP addressing methods and QOS parameters.</li> <li>To know the functions and congestion control mechanism of TCP.</li> <li>To know about application layer and network security.</li> </ul> |  |  |                     |                    |                        |                    |                         |                    |                             |          |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>   |  |  |                     |                    |                        |                    |                         |                    |                             |          |   |   |   |
| CO1  | Explain the networks, topologies and layers of OSI model, compare with TCP/IP model. |  |                     |                    |                        |                    |                         |                    |                             |          |   |   |   |
| CO2  | Classify error control and flow control techniques and types of LAN technologies.    |  |                     |                    |                        |                    |                         |                    |                             |          |   |   |   |
| CO3  | Analyze different routing algorithms and methods to improve QOS.                     |  |                     |                    |                        |                    |                         |                    |                             |          |   |   |   |
| CO4  | Explain the role of protocols in networking.   |  |                     |                    |                        |                    |                         |                    |                             |          |   |   |   |
| CO5  | Summarize the transport layer protocols and congestion controls methods.             |  |                     |                    |                        |                    |                         |                    |                             |          |   |   |   |
| CO6  | Describe various application layer services and cryptographic 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  | H                   |                    |                        | M                  | M                       |                    |                             |          | H | L |   |
|  | CO2  | M  | L                   |                    |                        |                    |                         |                    |                             | M        |   |   | M |
|  | CO3  | M  | H                   | M                  | M                      |                    |                         | H                  |                             |          | M |   |   |
|  | CO4  | M  | H                   | M                  | M                      | H                  |                         | M                  |                             | M        |   | H |   |
|  | CO5  |  |                     |                    |                        |                    |                         |                    | L                           | H        |   |   | L |
|  | CO6  | H  |                     |                    |                        |                    | M                       |                    |                             |          |   |   |   |
| 3  | Category   | Humanities & Social Studies (HS)                               | Basic Sciences (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/Seminar/ |          |   |   |   |
|  |  |  |                     |                    | √                      |                    |                         |                    |                             |          |   |   |   |
| 4  | Approval   | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                     |                    |                        |                    |                         |                    |                             |          |   |   |   |

**UNIT I DATA COMMUNICATION: 9**  
 ISO reference model, Open system standard, Transmission of Digital Data – Electrical Interface, MODEMS, Line Configuration, Encoding and Decoding, Multiplexing, Error Detection and Correction (CRC).

**UNIT II DATA LINK CONTROL AND PROTOCOLS: 9**  
 Flow control and error control, stop and wait, Sliding windows, Automatic Repeat (ARQ), Asynchronous Protocols, - X MODEM, Y MODEM, Synchronous protocols – Character Oriented and Bit oriented protocols (HDLC).

**UNIT III LOCAL AREA NETWORKS: 9**  
 IEEE 802 standards, LLC, MAC layer protocols – CSMA/CD Ethernet, Token Bus, Token Ring, FDDI, Distributed Queue Dual Bus, Switched Multimega Bit Data Service.

**UNIT IV WIDE AREA NETWORKS: 9**  
 Circuit Switch packet Switch, Message Switching, X .25 Protocols, Architecture And Layers of Protocol, Frame Delay, ISDN and ATM Protocol, Internet working Device, Repeater, Bridge, Routes and Gateways, Routing Algorithms.

**UNIT V UPPER OSI LAYERS: 9**  
 Session layer protocols, Presentation layer – Data Security, Encryption/Decryption, Authentication, Data Composition, Application layer protocols – MHS, File transfer, Virtual terminal, CMIP.

**TEXT BOOKS:**

1. Behrus A. Forouzane.tal, “Data Communication and Networking”, 2<sup>nd</sup> Edition, Tata McGraw-

**REFERENCE BOOKS:**

1. William Stallings, “Data and Computer Communication”, Fifth Edition, Prentice Hall of India,1997.
- 2.Andrew S.Tanenbaum, “Computer networks”, Third Edition, prentice Hall of India, 1996.
- 3.www.studytonight.com/computer-network...

|               |   |          |          |          |          |
|---------------|---|----------|----------|----------|----------|
| <b>BEC604</b> | <b>COMMUNICATION ENGINEERING - II</b>                                     | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|               | Total Contact Hours -45   | 3        | 0        | 0        | 3        |
|               | Prerequisite – CommunicationEngineering-I                                 |          |          |          |          |
|               | Course Designed by – – Dept. of Electronics And Communication Engineering |          |          |          |          |

| <b>OBJECTIVES</b>  |  |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |
|--|--|--|---|---------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|
| <ul style="list-style-type: none"> <li>To learn and understand</li> <li>The process of sampling, quantization and coding that are fundamental to the digital transmission of analog signals and digital modulation systems.</li> <li>Baseband and passband transmission systems.</li> <li>M-ary signaling and spread spectrum Techniques. .</li> </ul> |  |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |
| <b>COURSE OUTCOMES (COs)</b>   |  |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |
| CO1  | Students will learn about the basic concepts of Sampling, basic concepts of baseband transmission of binary data |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |
| CO2  | They gain knowledge about basics of digital modulation techniques.   |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |
| CO3  | They can understand the concepts of spread spectrum digital communication system                                 |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |
| CO4  | To provide in-depth analysis of noise performance in various receivers   |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |
| CO5  | Design basic communication systems   |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |
| CO6  | To understand the basic concepts of analog pulse modulation 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 |                     | M |                    | M | H                      |   | H                  |   |                         | H |
|  | CO2  | M  | M | H                   |   | M                  | M | M                      |   | H                  |   | M                       |   |
|  | CO3  | M  |   |                     | H |                    |   |                        |   | H                  |   |                         |   |
|  | CO4  | M  | M |                     |   | M                  |   | M                      |   | H                  |   |                         | L |
|  | CO5  |  | L | H                   |   | M                  |   |                        |   |                    |   | M                       |   |
|  | CO6  | M  | M |                     | M |                    | L |                        |   |                    |   | L                       |   |
| 3  | Category   | Humanities & Social Studies (HS)                               |   | Basic Sciences (BS) |   | 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 |   |                     |   |                    |   |                        |   |                    |   |                         |   |

## UNIT I SAMPLING AND QUANTIZATION

9

Sampling Process – Aliasing – Instantaneous sampling – Natural Sampling – Flat Sampling – Quantization of signals – sampling and quantizing effects – channel effects – SNR for quantization pulses – data formatting techniques – Time division multiplexing.

## UNIT II DIGITAL MODULATION

9

PCM Systems – Noise Considerations in PCM system – Overall Signal-tonoise ratio for PCM system – Threshold effect – Channel Capacity – Virtues, Limitations & Modification of PCM system – PCM Signal Multiplexing – Differential PCM – Delta Modulation – Noise Considerations in Delta Modulation – SNR Calculations – Comparison of PCM, DPCM & DM.

**UNIT III BASE BAND PULSE TRANSMISSION 9**

Maximum likelihood receiver structure – Matched filter receiver – Probability error of the Matched filter – Intersymbol interference – Nyquist criterion for distortionless baseband transmission – Correlative coding – Eye pattern.

**UNIT IV PASS BAND DATA TRANSMISSION 9**

Pass Band Transmission Model – Generation, Detection, Signal Space Diagram, Probability of Error for BFSK, BPSK, QPSK, DPSK, and Schemes – Comparison.

**UNIT V M-ARY SIGNALING AND INTRODUCTION TO SPREAD SPECTRUM TECHNIQUES 9**

M-ary signaling, vectoral view of MPSK and MFSK signaling, symbol error performance of M-ary systems – Introduction – Discrete Sequence Spread Spectrum technique – Use of Spread Spectrum with CDMA-Ranging Using Discrete Sequence Spread Spectrum – Frequency Hopping Spread Spectrum – Generation & Characteristics of PN Sequence.

**TEXT BOOKS:**

1. Bernard Sklar, “Digital Communication, Fundamentals and Application”, Pearson Education Asia, 2nd Edition, 2001.
2. Simon Haykin, “Communication Systems”, John Wiley & Sons, 4<sup>th</sup> Edition, 2000.
3. Taub & Schilling, “Principle of Communication Systems”, 2<sup>nd</sup> Edition, 2003.

**REFERENCEBOOKS:**

1. John G. Proakis, “Digital Communication”, McGraw Hill Inc, 5<sup>th</sup> Edition, 2008.
2. Singh, R.P. & Sapre, S.D, “Communication Systems: Analog & Digital”, Tata McGraw-Hill, 5th Reprint
3. www.scribd.com

|  |  |          |          |          |          |
|--|--|----------|----------|----------|----------|
| <b>BEI601</b>  | <b>CONTROL SYSTEMS</b>   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|  | Total Contact Hours - 60   | 4        | 0        | 0        | 4        |
|  | Prerequisite – Electronics and Instrumentation                               |          |          |          |          |
|  | Course Designed by – – Dept. of Electronics and Instrumentation Engineering. |          |          |          |          |
| <b>OBJECTIVES</b>  |  |          |          |          |          |
| <ul style="list-style-type: none"> <li>• To study control problem, control system dynamics and feedback principles.</li> <li>• To study time response of first and second order systems and basic state variable analysis and to do simple problems.</li> <li>• To study the concept of stability and criteria for stability and to do simple problems.</li> <li>• To study the frequency response through polar plots and Bode plots and Nyquist</li> </ul> |  |          |          |          |          |

|   |  |  |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
|---|--|--|---|-----------------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|---|--|
| stability criteria and to do simple problems.   |  |  |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| <b>COURSE OUTCOMES (COs)</b>  |  |  |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO1   | Outline the development of mathematical models to represent systems and their representation by transfer functions |  |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO2   | Discuss the transient and steady state response of control systems   |  |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO3   | Practice frequency domain plots (Bode and Polar)   |  |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO4   | Analyze performance of control systems   |  |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO5   | Design compensation networks   |  |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO6   | Design the different types of compensators   |  |   |                             |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| 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                      |   | M                  | M |                         |   |                    |  |   |  |
|   | CO2  | M  | L | H                           | M | M                  |   |                        |   | L                  |   |                         | L |                    |  |   |  |
|   | CO3  | M  |   |                             | H |                    |   |                        |   |                    |   |                         | M |                    |  |   |  |
|   | CO4  | M  |   | M                           |   | H                  |   | M                      |   |                    | H |                         |   |                    |  |   |  |
|   | CO5  |  | L |                             |   |                    |   |                        |   | M                  |   |                         |   |                    |  |   |  |
|   | 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 CONTROL SYSTEM MODELLING

12

System concept. Differential equations. Transfer functions. Introduction to model based design-Modelling of electric systems, Translational and rotational mechanical systems, simple Electro - mechanical systems. Block diagram representation of systems. Block Diagram reduction methods. Closed loop transfer function, determination of Signal flow graphs. Mason's gain formula. Examples.

## UNIT II TIME RESPONSE ANALYSIS:

12

First Order Systems. Impulse and Step Response analysis. Second Order system Analysis. Steady state error. Error Coefficients and Generalized error series. Principle of PI, PD and PID Compensation. Servo Motor, Synchros & Stepper Motor-analysis using Matlab.

## UNIT III STABILITY IN TIME DOMAIN

12

Stability Analysis. Routh - Hurwitz Criterion. Root locus Method. Construction of root, locus diagrams. Stability Study. Application of root locus diagram-analysis using Matlab.

**UNIT IV STABILITY IN FREQUENCY DOMAIN 12**

Frequency response analysis. Frequency domain specifications . Polar plot, Bode's Plot, Magnitude - Phase plot, Constant M and N Circles. Nichol's Chart Nyquist Stability Criterion. Relative Stability - gain Margin and Phase margin, determination from Polar plot, Bode's Plot and Magnitude – Phase Plot. Use of Nichol's Chart in system analysis to determine relative stability, **Bandwidth, Resonance peak and resonance frequency**- Analysis using Matlab.

**UNIT V COMPENSATION TECHNIQUES 12**

Cascade and feedback compensation. Lag, Lead and Lag- lead Compensation. Design of Cascade Compensators - Using Bode's Plot.

**TEXT BOOKS:**

1. J.Nagrath andM.Gopal, “Control SystemEngineering”, NewAgeInternational Publishers, 5thEdition, 2007.

**REFERENCE BOOKS:**

1. Benjamin.C.Kuo, “Automatic control systems”, Prentice Hall ofIndia, 7<sup>th</sup>Edition, 1995.
2. M.Gopal, “Control System– Principles and Design”,TataMcGrawHill, 2<sup>nd</sup> Edition,2002.
3. Schaum’sOutlineSeries, “FeedbackandControlSystems” Tata McGraw-Hill,2007.
4. John J.D’Azzo &ConstantineH.Houpis, “LinearControl System Analysisand Design”,Tata McGraw-Hill,Inc., 1995.
5. www.electrical4u.com

|  |   |          |          |          |          |
|--|---|----------|----------|----------|----------|
| <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 – Total Quality Management   |          |          |          |          |
|  | 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 |  |   |                             |   |                    |                        |                    |                         |                     |   |   |   |
| 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 (GOE) | Project/Term Paper/Seminar/ Internship (PR) |   |   |
|   |   | √  |   |                             |   |                    |                        |                    |                         |                     |   |   |   |
| 4   | Approval  | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                             |   |                    |                        |                    |                         |                     |   |   |   |

### 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, **Thriftiness (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, Channelising 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’SRESPONSIBILITIES FOR SAFETY

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 GLOBALISSUES**

**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

**TEXT BOOKS:**

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, New York 2005 (Units IV & V)

**REFERENCE BOOKS:**

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 (Units IV-V)
5. [www.waceinc.org/philly2011/conference.../KARSTE~1.PDF](http://www.waceinc.org/philly2011/conference.../KARSTE~1.PDF)

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|--|---|----------|----------|----------|----------|
| <b>BEC6L1</b>  | <b>COMPUTER COMMUNICATION AND NETWORKS LAB</b>                          | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|  | Total Contact Hours - 45  | 0        | 0        | 3        | 2        |
|  | Prerequisite – Communications background equivalent                     |          |          |          |          |
|  | Course Designed by – Dept. of Electronics and communication Engineering |          |          |          |          |
| <b>OBJECTIVES</b>  |   |          |          |          |          |
| <ul style="list-style-type: none"> <li>• Defining, using and implementing Computer Networks and the basic components of a Network system.</li> <li>• Knowing and Applying pieces of hardware and software to make networks more efficient, faster, more secure, easier to use, able to transmit several simultaneous messages, and able to interconnect with other networks.</li> <li>• Differentiating the various types of network configurations and applying them to meet the changing and challenging networking needs of organizations.</li> </ul> |   |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>   |   |          |          |          |          |
| CO1  | Understand fundamental underlying principles of computer networking     |          |          |          |          |
| CO2  | Understand details and functionality of layered network architecture .  |          |          |          |          |

|   |  |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
|---|--|--|---|---------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|---|--|
| CO3   | Apply mathematical foundations to solve computational problems in computer networking      |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO4   | Analyze and summarize research literature describing P2P file sharing system architectures |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO5   | Understand ethical, legal, security, and social issues related to computer networking      |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO6   | Participate in a medium scale team project utilizing modern software development tools     |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| 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                       | M |                    |  |   |  |
|   | CO2  | M  | L | H                   | M | M                  |   |                        |   |                    | M |                         |   |                    |  |   |  |
|   | CO3  | M  |   |                     | H |                    |   |                        |   | M                  |   |                         |   |                    |  |   |  |
|   | CO4  | M  | M |                     |   | H                  |   | M                      |   |                    |   | H                       | H |                    |  |   |  |
|   | CO5  |  | M | H                   |   |                    |   |                        |   |                    | L |                         | H |                    |  |   |  |
|   | CO6  |  |   |                     |   |                    | H |                        |   |                    |   |                         | H |                    |  |   |  |
| 3   | Category   | Humanities & Social Studies (HS)                               |   | Basic Sciences (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. PC to PC Communication Parallel Communication using 8 bit parallel cable Serial communication using RS 232C
2. Ethernet LAN protocol: To create scenario and study the performance of CSMA/CD protocol through simulation
3. Token bus and token ring protocols: To create scenario and study the performance of token bus and token ring protocols through simulation
4. Wireless LAN protocols: To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
5. Implementation and study of stop and wait protocol
6. Implementation and study of Go back-N and selective repeat protocols
7. Implementation of distance vector routing algorithm
8. Implementation of Link state routing algorithm
9. Implementation of Data encryption and decryption
10. Transfer of files from PC to PC using Windows / Unix socket processing

**Experiments beyond the syllabus should be conducted.**

|  |   |  |   |                     |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
|--|---|--|---|---------------------|---|--------------------|---|------------------------|----------|--------------------|----------|-------------------------|---|--------------------|--|--|--|
| <b>BEC6L2</b>  |   | <b>ELECTRONICS SYSTEM DESIGN LAB</b>                                     |   |                     |   |                    |   | <b>L</b>               | <b>T</b> | <b>P</b>           | <b>C</b> |                         |   |                    |  |  |  |
|  |   | Total Contact Hours - 45   |   |                     |   |                    |   | 0                      | 0        | 3                  | 2        |                         |   |                    |  |  |  |
|  |   | Prerequisite –Electronics Circuits and Communication engineering         |   |                     |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
|  |   | Course Designed by – Dept. of Electronics And Communication Engineering. |   |                     |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| <b>OBJECTIVES</b>  |   |  |   |                     |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| <ul style="list-style-type: none"> <li>To understand the design procedure of different power supplies.</li> <li>To know to design transreceiver and voltage regulator.</li> <li>To understand the working of Microprocessor and DSP based system design</li> </ul> |   |  |   |                     |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| <b>COURSE OUTCOMES (COs)</b>   |   |  |   |                     |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| CO1  | Design different forms of power supply.                                       |  |   |                     |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| CO2  | Design Voltage regulators and   |  |   |                     |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| CO3  | AM/FM transreceiver.  |  |   |                     |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| CO4  | Know the design procedure of Instrumentation amplifier and Digital Indicator. |  |   |                     |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| CO5  | Learn CAD based PCB layout design.  |  |   |                     |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| CO6  | Understand the working of modems and timers.                                  |  |   |                     |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| 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                       | M |                    |  |  |  |
|  | CO2   | M  | L | H                   | M | M                  |   |                        |          |                    | M        |                         |   |                    |  |  |  |
|  | CO3   | M  |   |                     | H |                    |   |                        |          | M                  |          |                         |   |                    |  |  |  |
|  | CO4   | M  | M |                     |   | H                  |   | M                      |          |                    |          | H                       | H |                    |  |  |  |
|  | CO5   |  | M | H                   |   |                    |   |                        |          |                    | L        |                         | H |                    |  |  |  |
|  | CO6   |  |   |                     |   |                    | H |                        |          |                    |          |                         |   | H                  |  |  |  |
| 3  | Category  | Humanities & Social Studies (HS)   |   | Basic Sciences (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

- Design of high current linear variable DC Power supply.
- Design of Switched Mode power supply.
- Design of AC / DC Voltage regulator using SCR.
- Design of Programmable Logic controller.

5. Design of process control timer.
6. Design of AM / FM transreceiver
7. Design of wireless data Modems
8. Design of Instrumentation amplifier and Digital Indicator
9. PCB layout Design using CAD
10. Microprocessor based system design.
11. DSP based system design.

**Experiments beyond the syllabus should be conducted.**

|  |   |   |   |   |   |   |   |          |          |          |          |   |   |
|--|---|---|---|---|---|---|---|----------|----------|----------|----------|---|---|
| <b>BEC6L3</b>  | <b>COMMUNICATION ENGINEERING-II LAB</b>   |   |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |
|  | Total Contact Hours - 45  |   |   |   |   |   |   | 0        | 0        | 3        | 2        |   |   |
|  | Prerequisite –Communication engineering-I Lab   |   |   |   |   |   |   |          |          |          |          |   |   |
|  | Course Designed by – Dept. of Electronics And Communication Engineering   |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>OBJECTIVES</b>  |   |   |   |   |   |   |   |          |          |          |          |   |   |
| <ul style="list-style-type: none"> <li>• To demonstrate digital communication concepts using hands-on experience and using simulation environments such as PSPICE/Multisim, or Matlab/Simulink, or LabVIEW.</li> <li>• To use commercial, modular systems which have some distinct advantages over bread boarding to examine more complex communication topics and to deliver a hands-on laboratory experience.</li> </ul> |   |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>COURSE OUTCOMES (COs)</b>   |   |   |   |   |   |   |   |          |          |          |          |   |   |
| CO1  | To understand lineartimeinvariantsystemwithrandominputs,andoptimumreceiverfor AWGN channel.                     |   |   |   |   |   |   |          |          |          |          |   |   |
| CO2  | To understand the Discrete channel models and itsproperties   |   |   |   |   |   |   |          |          |          |          |   |   |
| CO3  | To understand the Continuous channel models andits properties   |   |   |   |   |   |   |          |          |          |          |   |   |
| CO4  | Execute hardware implementation   |   |   |   |   |   |   |          |          |          |          |   |   |
| CO5  | They will have knowledge of basic types of digital modulation (ASK, FSK, and PSK) from mathematical description |   |   |   |   |   |   |          |          |          |          |   |   |
| CO6  | Develop understanding about performance of digital communication systems  |   |   |   |   |   |   |          |          |          |          |   |   |
| 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        | M        |          | L |   |
|  | CO2   | M | L | H |   |   |   |          |          |          |          |   |   |
|  | CO3   | M |   |   | H |   |   |          |          |          | L        |   | H |
|  | CO4   | M |   |   |   | H |   | M        |          | H        |          | H |   |
|  | CO5   |   | L |   |   |   |   |          | M        |          |          |   |   |
|  | CO6   |   |   |   |   |   |   | H        |          |          |          | H |   |

|   |          |  |                     |                    |                        |                    |                         |                    |  |
|---|----------|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|--|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences (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. FSK Modulation and Demodulation.
2. PSK Modulation and Demodulation.
3. QPSK Modulation and Demodulation.
4. DPSK Modulation and Demodulation.
5. PAM Modulation and Demodulation.
6. PWM Modulation and Demodulation.
7. PPM Modulation and Demodulation.
8. Pulse Code Modulation and Demodulation.
9. Delta Modulation and Demodulation.
10. Differential Pulse Code Modulation and Demodulation.
11. Data formatting.
12. BER comparison of different modulation schemes in AWGN channel in MATLAB Simulink.

### RESOURCESREQUIRED

1. PSK
2. PCM Kit
3. Delta modulation kit
4. Line coding and Decoding kit
5. FSK kit
6. PAM,PWM,PPM kit
7. Delta demodulation kit
8. Sampling kit

**Experiments beyond the syllabus should be conducted.**

|               |  |          |          |          |          |
|---------------|--|----------|----------|----------|----------|
| <b>BEC701</b> | <b>FIBRE OPTIC COMMUNICATION</b>   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|               | Total Contact Hours - 45   | 3        | 0        | 0        | 3        |
|               | Prerequisite – Microwave Engineering                                     |          |          |          |          |
|               | Course Designed by – Dept. of Electronics And Communication Engineering. |          |          |          |          |

| <b>OBJECTIVES</b>  |   |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
|--|---|--|---|---------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|---|--|
| <ul style="list-style-type: none"> <li>To learn the basic elements of optical fiber transmission link, fiber modes Configurations and structures.</li> <li>To understand the different kind of losses, signal distortion, SM fibers.</li> <li>To learn the various optical sources, materials and fiber splicing</li> <li>To learn the fiber optical receivers and noise performance in photo detector.</li> <li>To learn link budget, WDM, solitons and SONET/SDH network.</li> </ul> |   |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| <b>COURSE OUTCOMES (COs)</b>   |   |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO1  | Demonstrate an understanding of optical fiber communication link, structure, propagation and transmission properties of an optical fiber. |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO2  | Estimate the losses and analyze the propagation characteristics of an optical signal in different types of fibers                         |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO3  | Describe the principles of optical sources and power launching-coupling methods.  |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO4  | Compare the characteristics of fiber optic receivers.   |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO5  | Design a fiber optic link based on budgets  |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO6  | To assess the different techniques to improve the capacity of the 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  |   |                     |   |                    | M |                        | L | M                  |   | L                       |   |                    |  |   |  |
|  | CO2   | M  | L | H                   |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
|  | CO3   | M  |   |                     | H |                    |   |                        |   |                    | L |                         | H |                    |  |   |  |
|  | CO4   | M  |   |                     |   | H                  |   | M                      |   | H                  |   | H                       |   |                    |  |   |  |
|  | CO5   |  | L |                     |   |                    |   |                        | M |                    |   |                         |   |                    |  |   |  |
|  | CO6   |  |   |                     |   |                    | H |                        |   |                    | H |                         | M |                    |  |   |  |
| 3  | Category  | Humanities & Social Studies (HS)                               |   | Basic Sciences (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 OPTICAL FIBER<sup>9</sup>

Evolution of fiber Optic system – Element of an Optical Fiber Transmission link – Ray Optics – Optical Fiber Modes and Configurations – Mode theory of Circular Wave guides – Overview of Modes – Key Modal concepts – Linearly Polarized Modes – Single Mode Fibers – Graded Index fiber structure.

**UNIT II SIGNAL DEGRADATION IN OPTICAL FIBER 9**

Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides – Information Capacity determination – Group Delay – Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers – Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers – Mode Coupling – Design Optimization of SM fibers – RI profile and cut-off wavelength.

**UNIT III FIBER OPTICAL SOURCES 9**

Direct and indirect Band gap materials – LED structures – Light source materials – Quantum efficiency and LED power, Modulation of a LED, Laser Diodes – Modes and Threshold condition – Rate equations – External Quantum efficiency – Resonant frequencies – Laser Diodes structures and radiation patterns – Single Mode lasers – Modulation of Laser Diodes, Temperature effects, Introduction to Quantum laser, Fiber amplifiers.

**UNIT IV FIBER OPTICAL RECEIVERES 9**

PIN and APD diodes – Photo detector noise, SNR, Detector Response time, Avalanche multiplication Noise – Comparison of Photo detectors – Fundamental Receiver Operation – pre-amplifiers - Error Sources – Receiver Configuration – Probability of Error – The Quantum Limit.

**UNIT V DIGITAL TRANSMISSION SYSTEM 9**

Point-to-Point links – System considerations – Fiber Splicing and connectors – Link Power budget – Rise-time budget – Noise Effects on System Performance – Operational Principals of WDM, Solutions.

**TEXT BOOKS:**

1. Gerd Keiser, “Optical Fiber Communications, TataMcGraw–Hill Education Private Limited, New Delhi, Fifth Edition, 2008, Reprint, 2009.

**REFERENCE BOOKS:**

1. J.Senior, “Optical Communication, Principles and Practice”, Prentice Hall of India, Third Edition, 2004.
2. J.Gower, “Optical Communication System, Prentice Hall of India, 2001
3. Yarvi.A. Quantum Electronics, John Wiley 4<sup>th</sup> edition, 1995
4. <https://books.google.co.in/books?isbn=9380156693>

|   |  |          |          |          |          |
|---|--|----------|----------|----------|----------|
| <b>BEC702</b>   | <b>DIGITAL CMOS VLSI</b>   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|   | Total Contact Hours - 60   | 4        | 0        | 0        | 4        |
|   | Prerequisite – Principles of Digital Electronics                         |          |          |          |          |
|   | Course Designed by – Dept. of Electronics And Communication Engineering. |          |          |          |          |
| <b>OBJECTIVES</b>   |  |          |          |          |          |
| <ul style="list-style-type: none"> <li>• To learn basic CMOS Circuits.</li> <li>• To learn CMOS process technology.</li> <li>• To learn techniques of chip design using programmable devices.</li> <li>• To learn the concepts of designing VLSI Subsystems.</li> </ul> |  |          |          |          |          |

| COURSE OUTCOMES (COs)   |  |  |                     |                    |                        |                    |                         |                    |                             |   |   |   |   |
|---|--|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|-----------------------------|---|---|---|---|
| CO1   | Identify the various IC fabrication methods.   |  |                     |                    |                        |                    |                         |                    |                             |   |   |   |   |
| CO2   | Express the Layout of simple MOS circuit using Lambda based design rules.                    |  |                     |                    |                        |                    |                         |                    |                             |   |   |   |   |
| CO3   | About the implementation of various adders and multipliers in VLSI technology.               |  |                     |                    |                        |                    |                         |                    |                             |   |   |   |   |
| CO4   | About the design styles of FPGA.   |  |                     |                    |                        |                    |                         |                    |                             |   |   |   |   |
| CO5   | About testing of CMOS circuits.  |  |                     |                    |                        |                    |                         |                    |                             |   |   |   |   |
| CO6   | To understand the concepts of modeling a digital system using Hardware Description 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  | M  |                     |                    |                        |                    | M                       | M                  | H                           | M |   |   |   |
|   | CO2  | M  | L                   | H                  |                        |                    |                         |                    | M                           | H | H |   |   |
|   | CO3  | M  |                     |                    | H                      |                    |                         |                    | M                           |   | H | H | H |
|   | CO4  | M  |                     |                    |                        | H                  |                         | M                  | M                           |   |   |   | M |
|   | CO5  |  | L                   |                    |                        |                    |                         |                    |                             | L |   |   | M |
|   | CO6  | H  |                     |                    |                        | H                  | H                       |                    |                             |   |   |   | M |
| 3   | Category   | Humanities & Social Studies (HS)                               | Basic Sciences (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/Seminar/ |   |   |   |   |
|   |  |  |                     |                    |                        |                    |                         |                    |                             |   |   |   |   |
| 4   | Approval   | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                     |                    |                        |                    |                         |                    |                             |   |   |   |   |

### UNIT I INTRODUCTION TO MOS TRANSISTOR

12

MOS Fabrication, Enhancement mode and Depletion mode MOSFET, Threshold voltage derivation – body effect – Drain current Vs voltage derivation – channel length modulation - CMOS technologies, CMOS Fabrication: n-well – p-well – twin tub –DC transfer characteristics-

### UNIT II MOS CIRCUITS DESIGN PROCESS AND CMOS LOGIC GATES

12

MOS Layers, Stick Diagram, Layout Diagram, Propagation Delays, CMOS Static Logic Transmission Gate Logic, Tri-State Logic , Pass Transistor Logic , Dynamic CMOS Logic , Domino CMOS Logic,, Differential Cascade Voltage Switch (DCVS) Logic, Scaling of MOS Circuits.

### UNIT III VLSI IMPLEMENTATION STRATEGIES

12

Introduction – Design of Adders: carry look ahead-carry select-carry save. Design of multipliers: Array – Braun array – Baugh-Wooley Array. Introduction to FPGA – Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures.

**UNIT IV CMOS TESTING****12**

Need for testing- Testers, Test fixtures and test programs- Logic verification- Silicon debug principles- Manufacturing test – Design for testability – Boundary scan

**UNIT V SPECIFICATION USING VERILOG HDL****12**

Basic concepts- identifiers- gate primitives, gate delays, operators, timing controls, procedural assignments conditional statements, Data flow and RTL, structural gate levelswitch level modeling, Design hierarchies, Behavioral and RTL modeling, Test benches, Design of decoder, equality detector, comparator, priorityencoder, half adder, full adder, Ripple carry adder, D latch and D flip flop

**TEXT BOOKS:**

1. Weste and Harris: CMOS VLSI DESIGN (Third edition) Pearson Education, 2005
2. Uyemura J.P: Introduction to VLSI circuits and systems, Wiley 2002.

**REFERENCE BOOKS:**

- 1.D.A Pucknell & K.Eshraghian Basic VLSI Design, Third edition, PHI, 2003
- 2.Wayne Wolf, Modern VLSI design, Pearson Education, 2003
- 3.M.J.S.Smith: Application specific integrated circuits, Pearson Education, 1997
- 4.J.Bhasker: Verilog HDL primer, BS publication,2001
5. Ciletti Advanced Digital Design with the Verilog HDL, Prentice Hall of India, 2003
- 6.[https://en.wikipedia.org/wiki/Very-large-scale\\_integration](https://en.wikipedia.org/wiki/Very-large-scale_integration)

| <b>BEC702</b>  | <b>MICROWAVE ENGINEERING</b>  |  |  |  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|--|---|--|--|--|----------|----------|----------|----------|
|  | Total Contact Hours - 45  |  |  |  | 3        | 0        | 0        | 3        |
|  | Prerequisite –Electromagnetic Fields and Waves.   |  |  |  |          |          |          |          |
|  | Course Designed by – Dept. of Electronics And Communication Engineering                           |  |  |  |          |          |          |          |
| <b>OBJECTIVES</b>  |   |  |  |  |          |          |          |          |
| <ul style="list-style-type: none"> <li>• Microwave Engineering introduces the student to RF/microwave analysis methods and design techniques..</li> <li>• Scattering parameters are defined and used to characterize devices and system behavior. Passive and active devices commonly utilized in microwave subsystems are analyzed</li> <li>• To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.</li> <li>• To understand about microwave measurements..</li> </ul> |   |  |  |  |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>   |   |  |  |  |          |          |          |          |
| CO1  | Demonstrate the ability to identify formulate and solve microwave network related problems        |  |  |  |          |          |          |          |
| CO2  | Understand the need for the different microwave components and their specifications               |  |  |  |          |          |          |          |
| CO3  | Understand the working principles of different microwave sources                                  |  |  |  |          |          |          |          |
| CO4  | Demonstrate the ability to identify microwave active devices along with their applications.       |  |  |  |          |          |          |          |
| CO5  | Know how to model and determine the performance characteristics of a microwave circuit or system. |  |  |  |          |          |          |          |

|   |   |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
|---|---|--|---|---------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|---|--|
| CO6   | Identify the measurement techniques for different parameters like VSWR, impedance, frequency, power of microwave sources and 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 |                         | M |                    |  |   |  |
|   | CO2   | M  | M | M                   | M |                    |   |                        |   | H                  |   | M                       |   |                    |  |   |  |
|   | CO3   | M  |   | M                   | M | M                  |   |                        |   |                    |   |                         |   |                    |  |   |  |
|   | CO4   | M  |   |                     |   | M                  |   | M                      |   |                    | H |                         | M |                    |  |   |  |
|   | CO5   |  | M | M                   |   |                    |   |                        |   | M                  |   | M                       |   |                    |  |   |  |
|   | CO6   |  |   |                     | M |                    | H |                        |   |                    |   |                         | M |                    |  |   |  |
| 3   | Category  | Humanities & Social Studies (HS)                               |   | Basic Sciences (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 MICROWAVE NETWORK THEORY

7

Introduction –Microwave frequency range, applications of microwaves.– Scattering matrix representation of multi port network -properties of S-parameters – S matrix of a two port network with mismatched load – Z and ABCD parameters-Comparison between [S] - [Z] and [Y] matrices

### UNIT II MICROWAVE PASSIVE DEVICES

10

Coaxial cables-connectors and adapters – Wave guides- Matched terminations –Rectangular to circular wave guide transition–Wave guide corners – Bends and twists – Windows – Attenuators – Phase shifters – Wave guide tees– E plane tee – H plane tee – Magic tee – Isolators – Circulators –Directional couplers – scattering matrix derivation for all components .

### UNIT III MICROWAVE VACCUM TUBE DEVICES

10

Introduction – Two cavity klystron amplifier – Mechanism and mode of operation –Power output and efficiency -Applications – Reflex klystron oscillator – Mechanism and mode of operation-Power output – Efficiency – Mode curve –Applications – TWT amplifier – Principle of operation-gain and applications – Magnetron oscillator – Hull cut-off voltage mechanism of operation– Power output and efficiency –Applications – Numerical problems.

### UNIT IV MICROWAVE SEMICONDUCTOR DEVICES AND CIRCUITS

9

Principles of tunnel diodes - Varactor and Step recovery diodes – Transferred Electron Devices -Gunn diode- Avalanche Transit time devices- IMPATT and TRAPATT Devices- Parametric Amplifiers – Introduction to Micro strip Lines, & Monolithic Microwave Integrated circuits- Materials, MMIC Fabrication Techniques.

**UNIT V MICROWAVE MEASUREMENTS****9**

Introduction – Slotted line carriage — Spectrum analyzer – Network analyzer – Power measurements – Schottky barrier diode sensor – Bolometer sensor – Power sensor – High power measurement – Insertion loss and attenuation measurement – VSWR measurement – Low and high VSWR – Impedance measurement – Frequency measurement – Measurement of cavity Q – Dielectric measurement of a solid by wave-guide method – Antenna measurement – Radiation pattern – Phase and gain.

**TEXT BOOKS:**

1. Annapurna Das, Sisir K. Das, “Microwave Engineering”, TMH Co., Ltd., 1999.Reprint 2001.

**REFERENCE BOOKS:**

1. Collin R.E., “Foundation of Microwave Engineering”, 2nd Edition, TMH, 1992.
2. Samuel Y. Liao, “Microwave devices and Circuits”, PHI Pvt Ltd., 1995.
3. <http://www.microwaves101.com>

| <b>BEC704</b>   |  | <b>ANTENNA AND WAVE PROPAGATION</b> |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |
|---|--|-------------------------------------|---|---|---|---|---|----------|----------|----------|----------|---|---|
| Total Contact Hours – 60  |  |                                     |   |   |   |   |   | 4        | 0        | 0        | 4        |   |   |
| Prerequisite – Electromagnetic Fields and waves   |  |                                     |   |   |   |   |   |          |          |          |          |   |   |
| Course Designed by – Dept. of Electronics And Communication Engineering   |  |                                     |   |   |   |   |   |          |          |          |          |   |   |
| <b>OBJECTIVES</b>   |  |                                     |   |   |   |   |   |          |          |          |          |   |   |
| <ul style="list-style-type: none"> <li>• Students will be introduced to antennas, their principle of operation</li> <li>• Antenna analysis and their applications.</li> <li>• introduce the student to wave propagation over ground, through troposphere and ionosphere; diversity principles,</li> <li>• Propagation effects in microwave systems, satellite, space, and radar links.</li> </ul> |  |                                     |   |   |   |   |   |          |          |          |          |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |  |                                     |   |   |   |   |   |          |          |          |          |   |   |
| CO1   | Define various antenna parameters                        |                                     |   |   |   |   |   |          |          |          |          |   |   |
| CO2   | Analyze radiation patterns of antennas                   |                                     |   |   |   |   |   |          |          |          |          |   |   |
| CO3   | Evaluate antennas for given specifications               |                                     |   |   |   |   |   |          |          |          |          |   |   |
| CO4   | Illustrate techniques for antenna parameter measurements |                                     |   |   |   |   |   |          |          |          |          |   |   |
| CO5   | To understand the various applications of antennas.      |                                     |   |   |   |   |   |          |          |          |          |   |   |
| CO6   | Discuss radio wave propagation                           |                                     |   |   |   |   |   |          |          |          |          |   |   |
| 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  | M                                   | M | H | M | M |   |          |          |          | L        |   | L |
|   | CO3  | M                                   |   | M | H |   |   | M        |          | M        |          |   |   |
|   | CO4  | M                                   |   | M | M | H |   | M        |          |          |          | H |   |
|   | CO5  |                                     | L |   |   |   |   |          |          |          | M        |   | M |
|   | CO6  |                                     | M |   |   |   |   | L        |          |          |          |   |   |

|   |          |  |                     |                    |                        |                    |                         |                    |   |
|---|----------|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences (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 ANTENNA CONCEPTS

12

Radiation Patterns, Beam solid angle, radiation intensity, Directivity, effective aperture, Antenna field zones, Polarization, impedance, cross field, Poynting vector. Friis Transmission formula, Duality of Antennas, Antenna and Transmission line, Radiation from a dipole antenna, **Antenna temperature System temperature.**

### UNIT II POINT SOURCES

12

Definition, Power patterns, Array of two point sources – Pattern multiplication, Broad side array, End fire array, n-isotropic array, Evaluation of null directions and maxima, Amplitude distributions. **Concept of Phased arrays, Adaptive array, Basic principle of antenna Synthesis-Binomial array.**

### UNIT III SMALL ANTENNAS:

12

Halfwave dipole antenna radiated fields of short dipole, small loop and helical Antenna, monofilar- multifilar helix. Radiation resistance, Directivity and Design Feature. Half wave dipole: radiated fields and other feature. **Numerical tool for antenna analysis.**

### UNIT IV SPECIAL ANTENNAS:

12

Yagi uda Antenna, Tunstile antenna, Principle of frequency independent antennas –Spiral antenna, Helical antenna, Log periodic. Modern antennas- Reconfigurable antenna, Active antenna, Dielectric antennas, rhombic antenna, Horn antenna, Reflector antennas and their feed systems, Micro strip antenna, Impedance and antenna measurements.

### UNIT V WAVE PROPOGATION<sup>12</sup>

Ground wave propagation, Troposphere wave, wave- tilt of the surface wave, Ionosphere propagation – effective permittivity and Conductivity of ionized gas, Reflection – Refraction of waves from ionosphere, regular – irregular variation of Ionosphere, earth magnetic field, Faraday rotation, wave propagation in the Ionosphere. Duct propagation, Critical frequency and Space propagation,

### TEXT BOOKS:

1. John D Kraus, Ronald J Marhefka, Ahmad S Khan, “*Antenna and Wave Propagation*”, Tata McGraw Hill, 4th Edition, 2010.
2. R.L.Yadava, “*Antennas and Wave Propagation*”, PHI, 2011

**REFERENCE BOOKS:**

1. Constantine A.Balanis, “Antenna Theory: Analysis and Design”, Third Edition, John Wiley and Sons, 2012.
2. G.S.N. Raju, “Antennas and wave propagation”, 1st Edition Pearson Education, 2012.
3. Robert S. Elliott, “Antenna Theory and Design”, John Wiley and Sons, Revised Edition, 2007.
4. [www.studynama.com/.../229-Antenna-wave-propagation-\(AWP\)-pdf-eb](http://www.studynama.com/.../229-Antenna-wave-propagation-(AWP)-pdf-eb).

|   |   |  |                     |                    |                        |                    |                         |               |  |          |          |   |   |
|---|---|--|---------------------|--------------------|------------------------|--------------------|-------------------------|---------------|--|----------|----------|---|---|
| <b>BET7L1</b>   | <b>DIGITAL CMOS VLSI LAB</b>  |  |                     |                    |                        |                    |                         | <b>L</b>      | <b>T</b>                                     | <b>P</b> | <b>C</b> |   |   |
|   | Total Contact Hours - 45  |  |                     |                    |                        |                    |                         | 0             | 0  | 3        | 2        |   |   |
|   | Prerequisite –Verilog HDL and Principles of Digital Electronics Lab   |  |                     |                    |                        |                    |                         |               |  |          |          |   |   |
|   | Course Designed by – Dept. of Electronics And Communication Engineering.                                      |  |                     |                    |                        |                    |                         |               |  |          |          |   |   |
| <b>OBJECTIVES</b>   |   |  |                     |                    |                        |                    |                         |               |  |          |          |   |   |
| <ul style="list-style-type: none"> <li>• To learn Hardware Descriptive Language(Verilog/VHDL)</li> <li>• To learn the fundamental principles of VLSI circuit design in digital domain</li> <li>• To familiarize implementation of logical modules on FPGAs</li> </ul> |   |  |                     |                    |                        |                    |                         |               |  |          |          |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |   |  |                     |                    |                        |                    |                         |               |  |          |          |   |   |
| CO1   | Demonstrate a clear Understanding in hardware design language Verilog HDL.                                    |  |                     |                    |                        |                    |                         |               |  |          |          |   |   |
| CO2   | Model a Combinational circuit using hardware description language Verilog HDL and validate its functionality. |  |                     |                    |                        |                    |                         |               |  |          |          |   |   |
| CO3   | Design and implement a sub system on a FPGA board.  |  |                     |                    |                        |                    |                         |               |  |          |          |   |   |
| CO4   | Model a Sequential circuit using hardware description language Verilog HDL and validate its functionality..   |  |                     |                    |                        |                    |                         |               |  |          |          |   |   |
| CO5   | Demonstrate implementation of FPGA of ADC.  |  |                     |                    |                        |                    |                         |               |  |          |          |   |   |
| CO6   | To Understand the FPGA implementation of Traffic Light Controller   |  |                     |                    |                        |                    |                         |               |  |          |          |   |   |
| 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                       |               | M  |          | H        | H | H |
|   | CO2   | M  | M                   | H                  |                        | H                  | M                       | H             |  | M        |          |   |   |
|   | CO3   | M  | H                   |                    | H                      |                    |                         | L             | M  | M        | M        | M | H |
|   | CO4   | M  | H                   | H                  | M                      | H                  | M                       | H             |  | M        |          |   |   |
|   | CO5   |  | L                   |                    | M                      |                    |                         |               |  | L        |          |   |   |
|   | CO6   |  |                     |                    | M                      |                    |                         |               |  |          | L        |   |   |
| 3   | Category  | Humanities & Social Studies (HS)                               | Basic Sciences (BS) | Engg Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective | Project/Term Paper/ Seminar/ Internship (PR) |          |          |   |   |
|   |   |  |                     |                    |                        |                    |                         |               |  | √        |          |   |   |
| 4   | Approval  | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                     |                    |                        |                    |                         |               |  |          |          |   |   |

## LIST OF EXPERIMENTS

1. Design and implementation of logic gates
2. Design and implementation of Half adder and full adder
3. Design and implementation of Half subtractor and full subtractor
4. Design and implementation of Boolean expressions
5. Design and implementation of simple logic circuits
6. Design and implementation of MUX & DEMUX – 4x1 and 8x1
7. Encoder and decoder – 2x4 and 3x8
8. Magnitude comparator
9. Code converters
10. Design and implementation of counters
11. Design and implementation of flipflops
12. FPGA implementation of ADC
13. FPGA implementation of traffic light controller

## REQUIREMENTSHARDWARE

1. FPGA Trainer kit
2. ADC module
3. Traffic light interfacing module

## SOFTWARE

1. XILINX 10.1
2. Modelsim

Experiments beyond the syllabus should be conducted.

| <b>BEC7L2</b>  | <b>OPTICAL COMMUNICATION LAB</b>  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|--|---|----------|----------|----------|----------|
|  | Total Contact Hours - 45  | 0        | 0        | 3        | 2        |
|  | Prerequisite –Optical Communication   |          |          |          |          |
|  | Course Designed by – Dept. of Electronics And Communication Engineering.  |          |          |          |          |
| <b>OBJECTIVES</b>  |   |          |          |          |          |
| <ul style="list-style-type: none"><li>• To studythe performance parameters of optical source and detector.</li><li>• To study fiber losses and loss mechanism the operation of optical detectors – PIN photodiode, avalanche photodiode</li><li>• To study the light propagation of the fiber.</li></ul> |   |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>   |   |          |          |          |          |
| CO1  | Couple light in and out of fibers and connect them  |          |          |          |          |
| CO2  | Measure loss and dispersion in fibers   |          |          |          |          |
| CO3  | Measure the performance of analog and digital fiber links   |          |          |          |          |
| CO4  | Relate an integrated view of engineering by explaining the fundamental analogies between electrical and optical communication systems |          |          |          |          |
| CO5  | To study the numerical aperture of the fiber  |          |          |          |          |
| CO6  | To become familiar with different modes.  |          |          |          |          |

| 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      | M  | L | H                   | M | M                  |   | H                      | H | M                  | H |                         |   |
|   | CO3      | M  | H | H                   | H | M                  | M | M                      |   | M                  |   |                         | H |
|   | CO4      | M  | H |                     | M |                    |   | M                      | M | M                  |   |                         | M |
|   | CO5      | M  | M |                     |   | M                  | M |                        |   | L                  |   |                         |   |
|   | CO6      |  |   |                     | M |                    |   |                        |   |                    | M | H                       |   |
| 3   | Category | Humanities & Social Studies (HS)                               |   | Basic Sciences (BS) |   | 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

1. V-I and P-I characteristics of LED
2. V-I and P-I characteristics of Photodiode
3. Setting up an analog link using plastic fiber cable
4. Setting up a digital link using plastic fiber cable
5. Amplitude Modulation and Demodulation
6. Frequency modulation and Demodulation
7. Numerical Aperture for a Plastic Fiber
8. Pulse width modulation and Demodulation
9. Pulse position modulation and Demodulation
10. Time Division Multiplexing(TDM)
11. Finding V-number for a glass fiber(Multimode / single mode fiber)
12. Numerical Aperture for optical glass fiber(Multimode / single mode)
13. Coupling loss in optical glass fiber(multimode / single mode fiber)
14. Bit Error Rate Measurement
15. Study of Pulse Broadening

#### Resources required:

1. Optical Communication Kit
2. CRO
3. FG

**Experiments beyond the syllabus should be conducted.**

|   |   |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
|---|---|--|---|---------------------|---|--------------------|----------|------------------------|----------|--------------------|---|-------------------------|---|--------------------|--|---|--|
| <b>BEC7L3</b>   | <b>MICROWAVE ENGINEERING LAB</b>  |  |   |                     |   |                    | <b>L</b> | <b>T</b>               | <b>P</b> | <b>C</b>           |   |                         |   |                    |  |   |  |
|   | Total Contact Hours - 45  |  |   |                     |   |                    | 0        | 0                      | 3        | 2                  |   |                         |   |                    |  |   |  |
|   | Prerequisite –Transmission Lines and Networks                           |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
|   | Course Designed by – Dept. of Electronics And Communication Engineering |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| <b>OBJECTIVES</b>   |   |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| <ul style="list-style-type: none"> <li>Know about the behavior of microwave components.</li> <li>Understand the radiation pattern of horn antenna.</li> </ul> |   |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| <b>COURSE OUTCOMES (COs)</b>  |   |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| CO1   | Demonstrate the characteristics of Microwave sources                    |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| CO2   | Demonstrate the characteristics of directional Couplers                 |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| CO3   | To test the characteristics of microwave components                     |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| CO4   | To analyze the radiation pattern of antenna.                            |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| CO5   | To measure antenna gain   |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| CO6   | Practice microwave measurement procedures                               |  |   |                     |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| 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 |                    | M        |                        | L        |                    |   |                         |   |                    |  |   |  |
|   | CO2   | M  | L | H                   | H |                    |          |                        |          | H                  | M |                         | M |                    |  |   |  |
|   | CO3   | M  |   |                     | H |                    |          |                        |          |                    |   | L                       |   |                    |  |   |  |
|   | CO4   | M  |   |                     | H | M                  |          | M                      |          |                    |   |                         |   |                    |  |   |  |
|   | CO5   |  | M |                     | H | M                  |          |                        |          | L                  | M |                         | H |                    |  |   |  |
|   | CO6   |  |   |                     |   |                    |          | H                      |          |                    |   |                         | H |                    |  |   |  |
| 3   | Category  | Humanities & Social Studies (HS)                               |   | Basic Sciences (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

- Study of microwave components
- Characteristics of reflex klystron oscillator
- Characteristics of gunn diode oscillator
- Radiation pattern of horn antenna
- Measurement of Antenna gain
- Frequency and wavelength measurement
- Impedance measurement by slotted line method
- VSWR and Reflection Co-efficient measurement

9. Characteristics of E Plane/ H Plane Tee.
10. Characteristics of Magic Tee.
11. Characteristics of Directional coupler.

**Experiments beyond the syllabus should be conducted.**

|  |  |  |                     |                    |                        |                    |                         |                    |  |   |          |          |          |          |
|--|--|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|--|---|----------|----------|----------|----------|
| <b>BEC7P1</b>  | <b>TERM PAPER</b>  |  |                     |                    |                        |                    |                         |                    |  |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|  | Total Contact Hours - 45   |  |                     |                    |                        |                    |                         |                    |  |   | 0        | 0        | 3        | 2        |
|  | Prerequisite –Mini Project   |  |                     |                    |                        |                    |                         |                    |  |   |          |          |          |          |
|  | Course Designed by – Dept. of Electronics And Communication 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 Electronics And Communication 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                               |  |                     |                    |                        |                    |                         |                    |  |   |          |          |          |          |
| 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  | L                   | H                  |                        |                    |                         | H                  | H  | L | H        |          |          |          |
|  | CO3  | M  | H                   |                    | H                      |                    | M                       | L                  |  | M |          | H        | H        |          |
|  | CO4  | M  | H                   |                    | M                      | H                  |                         | M                  | M  | M |          |          |          |          |
|  | CO5  |  | L                   |                    |                        |                    |                         | M                  |  |   | L        |          |          |          |
|  | CO6  |  |                     |                    | M                      |                    |                         | H                  |  |   |          |          |          |          |
| 3  | Category   | Humanities & Social Studies (HS)                               | Basic Sciences (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 |                     |                    |                        |                    |                         |                    |  |   |          |          |          |          |

|   |   |          |          |          |          |
|---|---|----------|----------|----------|----------|
| <b>BEC8C1</b>   | <b>COMPREHENSION II</b>   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|   | 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 Electronics& Communication Engineering    |          |          |          |          |
| <b>OBJECTIVES</b>   |   |          |          |          |          |
| <ul style="list-style-type: none"> <li>To provide a complete review of Electronics&amp; Communication 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 - 45   | 0        | 0        | 18       | 9        |
|               | Prerequisite –Term paper   |          |          |          |          |
|               | Course Designed by – Dept. of Electronics and Communication Engineering. |          |          |          |          |

**OBJECTIVES**

- Learn to work as a member of a project team.
- Understand project management tasks.
- Develop a hardware / software solution for a real-time, industry relevant problem.

**COURSE OUTCOMES (COs)**

|     |  |
|-----|--|
| CO1 | Apply knowledge of basic science and engineering to Electronics and Communication 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                               |

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 |   | H |   |   |   |   |
|   | CO2     | M | L | H |   |   |   | H | H | L | H |   |   |
|   | CO3     | M | H |   | H |   | M | L |   | M |   | H | H |
|   | CO4     | M | H |   | M | H |   | M | M | M |   |   |   |
|   | CO5     |   | L |   |   |   |   | M |   |   | L |   |   |
|   | CO6     |   |   |   | M |   |   | H |   |   |   |   |   |

|   |          |  |                     |                    |                        |                    |                         |                    |   |
|---|----------|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences (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 |                     |                    |                        |                    |                         |                    |   |

### CORE ELECTIVE – I

|  |   |   |   |   |   |   |   |          |          |          |          |   |   |
|--|---|---|---|---|---|---|---|----------|----------|----------|----------|---|---|
| <b>BEC503</b>  | <b>TRANSMISSION LINES, NETWORKS AND WAVEGUIDES</b>  |   |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |
|  | Total Contact Hours – 45  |   |   |   |   |   |   | 3        | 0        | 0        | 3        |   |   |
|  | Prerequisite – Electromagnetic Fields and waves.  |   |   |   |   |   |   |          |          |          |          |   |   |
|  | Course Designed by – Dept. of Electronics And Communication Engineering                     |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>OBJECTIVES</b>  |   |   |   |   |   |   |   |          |          |          |          |   |   |
| <ul style="list-style-type: none"> <li>• To introduce the various types of transmission lines and to discuss the losses associated.</li> <li>• To give thorough understanding about impedance transformation and matching.</li> <li>• To impart knowledge on filter theories and waveguide theories</li> </ul> |   |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>COURSE OUTCOMES (COs)</b>   |   |   |   |   |   |   |   |          |          |          |          |   |   |
| CO1  | Discuss the fundamental concepts of wave propagation in Transmission Lines and Wave Guides. |   |   |   |   |   |   |          |          |          |          |   |   |
| CO2  | Analyze the line parameters and various losses in transmission lines.                       |   |   |   |   |   |   |          |          |          |          |   |   |
| CO3  | Apply smith chart for line parameter and impedance calculations                             |   |   |   |   |   |   |          |          |          |          |   |   |
| CO4  | Evaluate the characteristics of parallel plane and rectangular wave guides.                 |   |   |   |   |   |   |          |          |          |          |   |   |
| CO5  | Evaluate the characteristics of Circular waveguides.  |   |   |   |   |   |   |          |          |          |          |   |   |
| CO6  | Evaluate the characteristics of resonators.   |   |   |   |   |   |   |          |          |          |          |   |   |
| 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        |   | M |
|  | CO2   | M | L |   |   |   |   | M        |          | M        |          |   |   |
|  | CO3   | M | M |   | H | M |   |          |          | M        | L        |   |   |
|  | CO4   | M | M | M |   | H |   | M        |          |          |          |   | M |
|  | CO5   |   | M |   |   |   |   |          |          |          | M        |   | M |
|  | CO6   |   |   |   | M |   |   |          |          |          | L        |   |   |

|   |          |  |                |                    |                        |                    |                         |                    |   |
|---|----------|--|----------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences | 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 TIME VARYING FIELDS AND MAXWELL'S EQUATIONS 12

Motional Electromotive Force, General Expression for motional EMF, Faraday's Law of Induction, Displacement current, Maxwell's equation in the point or differential form, Maxwell's equations in Integral form, Maxwell's equations from Gauss's Law, Maxwell's equations and Boundary conditions, Poynting's theorem, Time harmonic (sinusoidal) fields, Maxwell's equations in phasor form.

### UNIT II TRANSMISSION LINES 12

Need for Transmission Lines, Types of Transmission lines, Characterization in terms of primary and secondary constants, Characteristic impedance, General wave equation, Loss less propagation, Propagation constant, Wave reflection at discontinuities, Voltage standing wave ratio, Transmission line of finite length, The Smith Chart, Smith Chart calculations for lossy lines, Impedance matching by Quarter wave transformer, Single and double stub matching.

### UNIT III THE UNIFORM PLANE WAVE 12

Wave propagation in free space, Wave propagation in dielectrics, Forward and Backward Travelling Wave, Poynting Theorem and Wave Power, Energy of the Radiated wave, Propagation in good conductors and good dielectrics, Skin effect, Wave polarization, Linearly, Elliptically and Circularly polarized waves,

### UNIT IV TRANSMISSION AND REFLECTION OF PLANE WAVES AT BOUNDARIES 12

Normal incidence of Uniform Plane waves: Conductor-Conductor interface, Dielectric-Dielectric interface, Dielectric-perfect Conductor interface, Dielectric-Conductor interface. Oblique incidence on a plane boundary for perpendicular polarization, Dielectric-Dielectric interface, Dielectric-Conductor interface.

### UNIT V WAVE GUIDES AND CAVITY RESONATORS 12

General Wave behaviors along uniform Guiding structures, Transverse Electromagnetic waves, Transverse Magnetic waves, Transverse Electric waves, TM and TE waves between parallel plates, TM and TE waves in Rectangular wave guides, Bessel's differential equation and Bessel function, TM and TE waves in Circular wave guides, Rectangular and circular cavity Resonators.

#### TEXTBOOK:

1. John D Ryder, "Networks Lines and Fields", Prentice Hall of India, New Delhi, 2005

**REFERENCE BOOKS:**

1. William H Hayt and John A Buck, “Engineering Electro Magnetic” Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008
2. David K Cheng, “Field and Wave Electromagnetics”, Pearson Education Inc, Delhi, 2004
3. John D Kraus and Daniel A Fleisch, “Electromagnetics with Applications”, McGraw Hill Book Co, 2005
4. GSN Raju, “Electromagnetic Field Theory and Transmission Lines”, Pearson Education, 2005
5. Bhag Singh Guru and HR Hiziroglu, “Electromagnetic Field Theory Fundamentals”, Vikas Publishing House, New Delhi, 2001.
6. N. Narayana Rao, “Elements of Engineering Electromagnetics” 6<sup>th</sup> Edition Prentice Hall, 2004
7. [mit.edu/.../Microwave\\_Engineering\\_David\\_M\\_Pozar\\_4ed\\_Wiley\\_2011](http://mit.edu/.../Microwave_Engineering_David_M_Pozar_4ed_Wiley_2011)

|   |   |   |   |   |   |   |          |          |          |          |   |   |   |
|---|---|---|---|---|---|---|----------|----------|----------|----------|---|---|---|
| <b>BEC001</b>   | <b>ADVANCED COMPUTER ARCHITECTURE</b>                                 |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |   |
|   | Total Contact Hours – 45  |   |   |   |   |   | 3        | 0        | 0        | 3        |   |   |   |
|   | Prerequisite – Programming and Data structures,                       |   |   |   |   |   |          |          |          |          |   |   |   |
|   | Course Designed by – Dept. of Electronics & Communication Engineering |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>OBJECTIVES</b>   |   |   |   |   |   |   |          |          |          |          |   |   |   |
| <ul style="list-style-type: none"> <li>• To make students know about the Parallelism concepts in Programming</li> <li>• To give the students an elaborate idea about the different memory systems and buses.</li> <li>• To introduce the advanced processor architectures to the students.</li> <li>• To make the students know about the importance of multiprocessor and multi-computers.</li> <li>• To study about data flow computer architectures</li> </ul> |   |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |   |   |   |   |   |   |          |          |          |          |   |   |   |
| CO1   | Demonstrate concepts of parallelism in hardware/software.             |   |   |   |   |   |          |          |          |          |   |   |   |
| CO2   | Discuss memory organization and mapping techniques.                   |   |   |   |   |   |          |          |          |          |   |   |   |
| CO3   | Describe architectural features of advanced processors.               |   |   |   |   |   |          |          |          |          |   |   |   |
| CO4   | Interpret performance of different pipelined processors.              |   |   |   |   |   |          |          |          |          |   |   |   |
| CO5   | Explain data flow in arithmetic algorithms                            |   |   |   |   |   |          |          |          |          |   |   |   |
| CO6   | Development of software to solve computationally intensive 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 |   |   |   |   | M        |          |          |          | M |   |   |
|   | CO2   | M | M | H |   |   |          |          | L        |          |   |   |   |
|   | CO3   | M |   | H | H |   |          |          |          | H        |   |   | H |
|   | CO4   | M |   |   |   | H |          | M        |          |          |   | M |   |
|   | CO5   |   | M |   |   | M |          |          |          |          | M |   |   |
|   | CO6   |   |   |   |   |   | H        |          |          |          |   |   |   |

|   |          |  |                |                    |                        |                    |                         |                    |   |
|---|----------|--|----------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences | 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 PARALLEL COMPUTER MODELS 9

Evolution of Computer architecture, system attributes to performance, Multi processors and multi computers, Multi-vector and SIMD computers, PRAM and VLSI models-Parallelism in Programming, conditions for Parallelism-Program Partitioning and Scheduling-program flow Mechanisms-Speed up performance laws-Amdahl's law, Gustafson's law-Memory bounded speedup Model.

### UNIT II MEMORY SYSTEMS AND BUSES 9

Memory hierarchy-cache and shared memory concepts-Cache memory organization-cache addressing models, Aliasing problem in cache, cache memory mapping techniques-Shared memory organization-Interleaved memory organization, Lower order interleaving, Higher order interleaving. Back plane bus systems-Bus addressing, arbitration and transaction.

### UNIT III ADVANCED PROCESSORS 9

Instruction set architectures-CISC and RISC scalar processors-Super scalar processors-VLIW architecture- Multivector and SIMD computers-Vector processing principles-Cray Y-MP 816 system-Inter processor communication

### UNIT IV MULTI PROCESSOR AND MULTI COMPUTERS 9

Multiprocessor system interconnects- Cross bar switch, Multiport memory-Hot spot problem, Message passing mechanisms-Pipelined processors-Linear pipeline, on linear pipeline-Instruction pipeline design-Arithmetic pipeline design.

### UNIT V DATA FLOW COMPUTERS AND VLSI COMPUTATIONS 9

Data flow computer architectures-Static, Dynamic-VLSI Computing Structures-Systolic array architecture, mapping algorithms into systolic arrays, Reconfigurable processor array-VLSI matrix arithmetic processors-VLSI arithmetic models, partitioned matrix algorithms, matrix arithmetic pipelines.

#### TEXT BOOKS:

1. Kai Hwang, "Advanced Computer Architecture Parallelism, Scalability, Programmability", McGraw Hill,N.Y, 2003
2. Kai Hwang and F.A.Briggs, "Computer architecture and parallel processor" McGraw Hill,N.Y, 1999

**REFERENCE BOOKS:**

1. David A. Patterson and John L. Hennessey, —Computer organization and design Elsevier, Fifth edition, 2014.
2. [www.sci.tamucc.edu/~sking/Courses/COSC5351/syllabus.php](http://www.sci.tamucc.edu/~sking/Courses/COSC5351/syllabus.php)

|   |  |   |   |   |   |   |   |   |   |   |   |          |          |          |          |
|---|--|---|---|---|---|---|---|---|---|---|---|----------|----------|----------|----------|
| <b>BEC008</b>   | <b>MEMS AND NEMS</b>   |   |   |   |   |   |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|   | Total Contact Hours – 45   |   |   |   |   |   |   |   |   |   |   | 3        | 0        | 0        | 3        |
|   | Prerequisite –Cellular Mobile Communication  |   |   |   |   |   |   |   |   |   |   |          |          |          |          |
|   | Course Designed by – Dept. of Electronics And Communication Engineering.   |   |   |   |   |   |   |   |   |   |   |          |          |          |          |
| <b>OBJECTIVES</b>   |  |   |   |   |   |   |   |   |   |   |   |          |          |          |          |
| <ul style="list-style-type: none"> <li>• Have a concept on the scope and recent development of the science and technology of micro- and nano-systems;</li> <li>• Gain the physical knowledge underlying the operation principles and design of micro- and nano- systems;</li> <li>• Learn some typical or potentially applicable micro- and nano-systems at the frontier of the development of the field..</li> </ul> |  |   |   |   |   |   |   |   |   |   |   |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>  |  |   |   |   |   |   |   |   |   |   |   |          |          |          |          |
| CO1   | Ability to understand the operation of micro devices, micro systems and their applications.  |   |   |   |   |   |   |   |   |   |   |          |          |          |          |
| CO2   | Ability to design the micro devices, micro systems using the MEMS fabrication process.   |   |   |   |   |   |   |   |   |   |   |          |          |          |          |
| CO3   | Gain a knowledge of basic approaches for various sensor design   |   |   |   |   |   |   |   |   |   |   |          |          |          |          |
| CO4   | Gain a knowledge of basic approaches for various actuator design   |   |   |   |   |   |   |   |   |   |   |          |          |          |          |
| CO5   | Develop experience on micro/nano systems for photonics.  |   |   |   |   |   |   |   |   |   |   |          |          |          |          |
| CO6   | Gain the technical knowledge required for computer-aided design, fabrication, analysis and characterization of nano-structured materials, micro- and nano-scale 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 |   |   |   | M | M |   | H | M | H |          | M        |          |          |
|   | CO2  | M | M | M |   | M |   | H |   |   |   |          | M        |          |          |
|   | CO3  | M | H |   | M |   | M |   |   |   |   | H        |          |          |          |
|   | CO4  | M | H | M |   |   |   | M | M |   | M |          |          |          |          |
|   | CO5  |   | M | M |   | H | M |   | M | M |   | M        | M        |          |          |
|   | CO6  |   |   |   | M | H | H |   |   |   | M |          |          | M        |          |

|   |          |  |                  |                    |                        |                    |                         |                    |  |
|---|----------|--|------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|--|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & | 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 OVERVIEW AND INTRODUCTION 9

New trends in Engineering and Science: Micro and Nanoscale systems Introduction to Design of MEMS and NEMS, Overview of Nano and Micro Electromechanical Systems, Applications of Micro and Nano Electromechanical systems, Micro Electromechanical systems, devices and structures Definitions, Materials for MEMS: Silicon, silicon compounds, polymers, metals

## UNIT II MEMS FABRICATION TECHNOLOGIES 9

Microsystem fabrication processes: Photolithography, Ion Implantation, Diffusion, Oxidation. Thin film depositions: LPCVD, Sputtering, Evaporation, Electroplating; Etching techniques: Dry and wet etching, electrochemical etching; Micromachining: Bulk Micromachining, Surface Micromachining, High Aspect-Ratio (LIGA and LIGA-like) Technology; Packaging: Microsystems packaging, Essential packaging technologies, Selection of packaging materials

## UNIT III MICRO SENSORS 9

MEMS Sensors: Design of Acoustic wave sensors, resonant sensor, Vibratory gyroscope, Capacitive and Piezo Resistive Pressure sensors- engineering mechanics behind these Microsensors. Case study: Piezo-resistive pressure sensor

## UNIT IV MICRO ACTUATORS 9

Design of Actuators: Actuation using thermal forces, Actuation using shape memory Alloys, Actuation using piezoelectric crystals, Actuation using Electrostatic forces (Parallel plate, Torsion bar, Comb drive actuators), Micromechanical Motors and pumps. Case study: Comb drive actuators

## UNIT V NANOSYSTEMS AND QUANTUM MECHANICS 9

Atomic Structures and Quantum Mechanics, Molecular and Nanostructure Dynamics: Shrodinger Equation and Wavefunction Theory, Density Functional Theory, Nanostructures and Molecular Dynamics, Electromagnetic Fields and their quantization, Molecular Wires and Molecular Circuits.

### TEXT BOOKS:

1. Marc Madou, "Fundamentals of Micro Fabrication", CRC press 1997.
2. Stephen D. Senturia, "Micro system Design", Kluwer Academic Publishers, 2001

**REFERENCE BOOKS:**

1. Tai Ran Hsu ,”MEMS and Microsystems Design and Manufacture” ,Tata McGraw Hill,2002.
2. Chang Liu, “Foundations of MEMS”, Pearson Education India Limited, 2006
3. www.tutorials point.com

|  |   |  |   |                |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
|--|---|--|---|----------------|---|--------------------|---|------------------------|----------|--------------------|----------|-------------------------|---|--------------------|--|--|--|
| <b>BEC005</b>  | <b>BLUE TOOTH TECHNOLOGY</b>  |  |   |                |   |                    |   | <b>L</b>               | <b>T</b> | <b>P</b>           | <b>C</b> |                         |   |                    |  |  |  |
|  | Total Contact Hours – 45  |  |   |                |   |                    |   | 3                      | 0        | 0                  | 3        |                         |   |                    |  |  |  |
|  | Prerequisite – Wireless Communication,  |  |   |                |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
|  | Course Designed by – Dept. of Electronics & Communication Engineering                       |  |   |                |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| <b>OBJECTIVES</b>  |   |  |   |                |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| <ul style="list-style-type: none"> <li>• To study the fundamental concepts of Bluetooth module.</li> <li>• To analyze the protocol operation.</li> <li>• To gain knowledge on various low power modes and Quality of Service parameters.</li> <li>• To understand the security issues</li> </ul> |   |  |   |                |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| <b>COURSE OUTCOMES (COs)</b>   |   |  |   |                |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| CO1  | Understand Bluetooth's standards, architecture and operation.                               |  |   |                |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| CO2  | Understand the APIs, radio interface used by Bluetooth.                                     |  |   |                |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| CO3  | Configure Bluetooth-enabled devices including mobile phones, PDAs and Access Points.        |  |   |                |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| CO4  | Install and configure Bluetooth hardware and software.                                      |  |   |                |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| CO5  | Configure LAN access, remote access and FAX gateway access point solutions using Bluetooth. |  |   |                |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| CO6  | Understand the Protocol layers used by Bluetooth..  |  |   |                |   |                    |   |                        |          |                    |          |                         |   |                    |  |  |  |
| 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 |                        |          | M                  | M        |                         | M |                    |  |  |  |
|  | CO2   | M  | M | H              |   |                    |   |                        | L        |                    |          |                         | M |                    |  |  |  |
|  | CO3   | M  |   | H              | H | H                  |   | M                      |          | H                  |          |                         | H |                    |  |  |  |
|  | CO4   | M  |   |                |   |                    |   | L                      |          |                    |          | M                       |   |                    |  |  |  |
|  | CO5   |  | M |                |   | M                  |   |                        |          | M                  |          |                         |   |                    |  |  |  |
|  | CO6   |  | M | H              |   | M                  | H |                        |          |                    | M        |                         | M |                    |  |  |  |
| 3  | Category  | Humanities & Social Studies (HS)                               |   | Basic Sciences |   | 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 CONCEPTS****9**

Origin, Blue tooth SIG, Protocol Stack, Security, applications and Profiles, Management, Test and qualification Technology Basics. RF and IR Wireless Communication.

**UNIT II BLUETOOTH MODULE****9**

Antennas Patterns, Gain and losses; Types of antennas: on chip antennas Radio interface: FH, Modulation, symbol timing, power emission and control, Performance Parameters, RF architecture, Blur RF, Base band:- Blue tooth Device address system Timing ,Physical links , Packet, structuring types and construction, channel coding and time base synchronization.

**UNIT III LINK CONTROLLER AND MANAGEMENT****9**

Link controller and management: LCP, controller states, Pico net and scattered operations, Master/Slave Role switching LC Architectural Overview, LMC< Link set up, Quality of service, LMP version, Name Represent, Test Mode.

**UNIT IV BLUETOOTH HOST****9**

L LC and adaptation Protocol L2cap signalling: Connections: Blue Tooth profiles; Version 1.0; Generic Profiles, Serial and Object exchange.

**UNIT V SECURITY****9**

Encryption and Security Key generation, security Modes and architecture, Low power Operation and QOS Management.

**TEXT BOOKS:**

1. Jennifer Bray and C.F. Stuntman “BlueTooth Connect Without Cables”, Pearson Education 2001.

**REFERENCES**

1. Blue Tooth Revealed: Brent A. Miller and C. Bisdikian, Pearson Education 2001.
2. Bluetooth Demystified Nathan J. Miller Tata McGraw Hill 2001
3. [www.radio-electronics.com/info/.../bluetooth/bluetooth\\_overview.php](http://www.radio-electronics.com/info/.../bluetooth/bluetooth_overview.php)

**CORE ELECTIVE-II**

|  |  |          |          |          |          |
|--|--|----------|----------|----------|----------|
| <b>BEC015</b>  | <b>ASIC DESIGN</b>   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|  | Total Contact Hours – 45   | 3        | 0        | 0        | 3        |
|  | Prerequisite – Electronic Circuits and Principles of Digital Electronics |          |          |          |          |
|  | Course Designed by – Dept. of Electronics And Communication Engineering. |          |          |          |          |
| <b>OBJECTIVES</b>  |  |          |          |          |          |
| <ul style="list-style-type: none"> <li>• To acquire knowledge about different types of ASICs design.</li> <li>• To study about various types of Programmable ASICs architectures and interconnects.</li> </ul> |  |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>   |  |          |          |          |          |
| CO1  | Recognize need for programmable devices.                                 |          |          |          |          |
| CO2  | Describe architecture of programmable devices.                           |          |          |          |          |
| CO3  | Explain programmable methodologies.                                      |          |          |          |          |

|   |   |  |   |                                |   |                       |                           |   |                       |                            |   |                       |   |
|---|---|--|---|--------------------------------|---|-----------------------|---------------------------|---|-----------------------|----------------------------|---|-----------------------|---|
| CO4   | Recall IC fabrication techniques vis-à-vis CMOS switch. |  |   |                                |   |                       |                           |   |                       |                            |   |                       |   |
| CO5   | Relate design and implementation flow for PLDs.         |  |   |                                |   |                       |                           |   |                       |                            |   |                       |   |
| CO6   | Low power design techniques and methodologies.          |  |   |                                |   |                       |                           |   |                       |                            |   |                       |   |
| 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                     | M                         | M | H                     | M                          |   | L                     |   |
|   | CO2   | M  | L | H                              |   |                       |                           | H |                       | L                          | H |                       |   |
|   | CO3   | M  | H | M                              |   |                       |                           | M | M                     | M                          |   | H                     | H   |
|   | CO4   | M  | H | H                              |   | M                     |                           |   |                       | M                          |   | M                     | M   |
|   | CO5   |  | L |                                |   | M                     | M                         | M |                       | L                          |   | M                     | M   |
|   | CO6   |  |   |                                | M | M                     | H                         | M |                       |                            |   |                       |   |
| 3   | Category  | Humanities &<br>Social Studies<br>(HS)                         |   | Basic Sciences &<br>Maths (BS) |   | Engg Sciences<br>(ES) | Professional Core<br>(PC) |   | Core Elective<br>(CE) | Non-Major<br>Elective (NE) |   | Open Elective<br>(OE) | Project/Term<br>Paper/<br>Seminar/<br>Internship (PR) |
|   |   |  |   |                                |   |                       |                           | √ |                       |                            |   |                       |   |
| 4   | Approval  | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |   |                                |   |                       |                           |   |                       |                            |   |                       |   |

### UNIT I INTRODUCTION TO ASICs, CMOS LOGIC, ASIC LIBRARY DESIGN 9

Types of ASICs - Design flow – CMOS transistors- CMOS Design rules –Combinational logic Cell Sequential logic cell - Transistor as Resistors - Transistor parasitic capacitance – Logical effort - Library cell design – Library architecture.

### UNIT II PROGRAMMABLE ASICs, PROGRAMMABLE ASIC LOGIC CELLS 9

Anti fuse - Static RAM - EPROM and EEPROM technology - PREP benchmarks - Actel ACT - Xilinx LCA –Altera FLEX - Altera MAX DC & AC inputs and outputs - Xilinx I/O blocks.

### UNIT III PROGRAMMABLE ASIC INTERCONNECT, PROGRAMMABLE ASIC DESIGN SOFTWARE AND LOW LEVEL DESIGN9

Entry: Actel ACT -Xilinx LCA - Xilinx EPLD - Altera MAX 5000 and 7000 - Altera MAX 9000 - Altera FLEX –Design systems - Logic Synthesis - Half gate ASIC -Low level design language - PLA tools EDIF- CFI design representation.

### UNIT IV SILICON ON CHIP DESIGN 9

Voice over IP SOC - Intellectual Property – SOC Design challenges- Methodology and design-FPGA to ASIC conversion – Design for integration-SOC verification-Set top box SOC.

### UNIT V PHYSICAL AND LOW POWER DESIGN 9

Over view of physical design flow- tips and guideline for physical design- modern physical design techniques- power dissipation-low power design techniques and methodologies-low power design tools- tips and guideline for low power design.

**TEXT BOOKS:**

1. M.J.S. Smith, “Application Specific Integrated Circuits”, Pearson Education, 2008

**REFERENCE BOOKS:**

1. Wayne Wolf, “FPGA-Based System Design”, Prentice Hall PTR, 2009.
2. Farzad Nekoogar and Faranak Nekoogar, “From ASICs to SOCs: A Practical Approach”, Prentice Hall PTR, 2003.
3. [www.vhdl.org/rassp/vhdl/guidelines/DesignReq.pdf](http://www.vhdl.org/rassp/vhdl/guidelines/DesignReq.pdf)

|  |  |          |          |          |          |   |   |   |   |   |   |   |   |
|--|--|----------|----------|----------|----------|---|---|---|---|---|---|---|---|
| <b>BEC012</b>  | <b>CRYPTOGRAPHY AND NETWORK SECURITY</b>                                     | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |   |   |   |   |   |   |
|  | Total Contact Hours – 45   | 3        | 0        | 0        | 3        |   |   |   |   |   |   |   |   |
|  | Prerequisite –Communication Engineering-II                                   |          |          |          |          |   |   |   |   |   |   |   |   |
|  | Course Designed by – Dept. of Electronics And Communication Engineering.     |          |          |          |          |   |   |   |   |   |   |   |   |
| <b>OBJECTIVES</b>  |  |          |          |          |          |   |   |   |   |   |   |   |   |
| <ul style="list-style-type: none"> <li>• To know about various encryption techniques.</li> <li>• To understand the concept of Public key cryptography.</li> <li>• To study about message authentication and hash functions</li> <li>• To impart knowledge on Network security</li> </ul> |  |          |          |          |          |   |   |   |   |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>   |  |          |          |          |          |   |   |   |   |   |   |   |   |
| CO1  | Classify the symmetric encryption techniques.                                |          |          |          |          |   |   |   |   |   |   |   |   |
| CO2  | Illustrate various Public key cryptographic techniques.                      |          |          |          |          |   |   |   |   |   |   |   |   |
| CO3  | Evaluate the authentication and hash algorithms.                             |          |          |          |          |   |   |   |   |   |   |   |   |
| CO4  | Discuss authentication applications  |          |          |          |          |   |   |   |   |   |   |   |   |
| CO5  | Summarize the intrusion detection and its solutions to overcome the attacks. |          |          |          |          |   |   |   |   |   |   |   |   |
| CO6  | Basic concepts of system level security                                      |          |          |          |          |   |   |   |   |   |   |   |   |
| 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 | M | M | H | M |   | L |   |
|  | CO2  | M        | L        | H        |          |   |   | H |   | L | H |   |   |
|  | CO3  | M        | H        | M        | M        |   |   | M | M | M |   | H | H |
|  | CO4  | M        | H        | H        |          | M |   |   |   | M |   | M | M |
|  | CO5  |          | M        |          |          | M | M | M |   | M |   |   | M |
|  | CO6  |          |          |          | 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 INTRODUCTION

9

OSI Security Architecture - Classical Encryption techniques – Cipher Principles – DataEncryption Standard – Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES – AES Cipher – Triple DES – Placement of Encryption Function – Traffic Confidentiality

### UNIT II PUBLIC KEY CRYPTOGRAPHY

9

Key Management - Diffie-Hellman key Exchange – Elliptic Curve Architecture and Cryptography - Introduction to Number Theory – Confidentiality using Symmetric Encryption – Public Key Cryptography and RSA.

### UNIT III AUTHENTICATION AND HASH FUNCTION

9

Authentication requirements – Authentication functions – Message Authentication Codes – Hash Functions – Security of Hash Functions and MACs – MD5 message Digest algorithm - Secure Hash Algorithm – RIPEMD – HMAC Digital Signatures – Authentication Protocols – Digital Signature Standard.

### UNIT IV NETWORK SECURITY

9

Authentication Applications: Kerberos – X.509 Authentication Service – Electronic Mail Security – PGP – S/MIME – IP Security – Web Security.

### UNIT V SYSTEM LEVEL SECURITY

9

Intrusion detection – password management – Viruses and related Threats – Virus Counter measures – Firewall Design Principles – Trusted Systems.

### TEXT BOOKS:

1. WilliamStallings,CryptographyandNetworkSecurity,6<sup>th</sup> Edition,PearsonEducation,March 2013.
- 2.CharlieKaufman,RadiaPerlmanandMikeSpeciner,“NetworkSecurity”,PrenticeHallofIndia,2002.

### REFERENCE BOOKS:

1. BehrouzA.Ferouzan, “Cryptography&NetworkSecurity”,TataMcGrawHill,2007.
2. Charles Pfleeger, “Security in Computing”,4<sup>th</sup> Edition,Prentice Hall ofIndia,2006.
3. Ulysess Black, “InternetSecurity Protocols”, PearsonEducationAsia,2000.

4. Charlie Kaufman and Radia Perlman, Mike Speciner, "Network Security, Second Edition, Private Communication in Public World", PHI, 2002.
5. Bruce Schneier and Neils Ferguson, "Practical Cryptography", First Edition, Wiley Dream Tech India Pvt Ltd, 2003.
6. [www.ics.uci.edu/~stasio/spring04/ics180.html](http://www.ics.uci.edu/~stasio/spring04/ics180.html)

|   |  |  |   |                             |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
|---|--|--|---|-----------------------------|---|--------------------|---|------------------------|---|--------------------|----------|-------------------------|----------|--------------------|--|---|--|
| <b>BEC010</b>   | <b>VLSI DESIGN</b>   |  |   |                             |   |                    |   |                        |   |                    | <b>L</b> | <b>T</b>                | <b>P</b> | <b>C</b>           |  |   |  |
|   | Total Contact Hours - 45   |  |   |                             |   |                    |   |                        |   |                    | 3        | 0                       | 0        | 3                  |  |   |  |
|   | Prerequisite – Principles of Digital Electronics                           |  |   |                             |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
|   | Course Designed by – Dept. of Electronics And Communication Engineering.   |  |   |                             |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| <b>OBJECTIVES</b>   |  |  |   |                             |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| <ul style="list-style-type: none"> <li>• To learn basic CMOS Circuits.</li> <li>• To learn CMOS process technology.</li> <li>• To learn techniques of chip design using programmable devices.</li> <li>• To learn the concepts of designing VLSI Subsystems.</li> </ul> |  |  |   |                             |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| <b>COURSE OUTCOMES (COs)</b>  |  |  |   |                             |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| CO1   | Identify the various IC fabrication methods.                               |  |   |                             |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| CO2   | Express the Layout of simple MOS circuit using Lambda based design rules.  |  |   |                             |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| CO3   | Apply the Lambda based design rules for subsystem design.                  |  |   |                             |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| CO4   | Differentiate various FPGA architectures.                                  |  |   |                             |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| CO5   | Design an application using Verilog HDL.                                   |  |   |                             |   |                    |   |                        |   |                    |          |                         |          |                    |  |   |  |
| CO6   | Concepts of modeling a digital system using Hardware Description 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  |   |                             |   |                    | M |                        | H |                    |          |                         |          |                    |  |   |  |
|   | CO2  | M  | L | H                           |   |                    |   |                        | M | L                  | H        |                         |          |                    |  |   |  |
|   | CO3  | M  |   |                             | H |                    |   |                        | M |                    |          | H                       | H        |                    |  |   |  |
|   | CO4  | M  |   |                             |   | H                  |   | M                      | M |                    |          |                         |          |                    |  |   |  |
|   | 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 MOS TRANSISTOR THEORY****9**

MOSFET– Enhancement mode & Depletion mode – Fabrication – NMOS, PMOS – CMOS fabrication – P-well, N-well, Twin-Tub, SOI – BiCMOS Technology –Comparison with CMOS.

**UNIT II MOS CIRCUITS AND DESIGN****9**

Basic Electrical properties of MOS circuits – DC Equations, NMOS & CMOS inverter –Second Order Effects– Basic circuit concepts-Sheet resistance-Area Capacitances-Capacitance calculations-Inverter delays–Scaling of MOS Devices –Scaling Models and Scaling Factors-MOS layers – Stick diagram – NMOS Design Style – CMOS Design style – lambda based design rules– Simple Layout examples

**UNIT III SUBSYSTEM DESIGN & LAYOUT****9**

Switch Logic – Pass transistors and transmission gates – Two input NMOS, CMOS gates: NOT–NAND– NOR gates – Other forms of CMOS logic – Static CMOS logic-Dynamic CMOS logic – Clocked CMOS logic - Precharged domino CMOS logic – Structured design of simple Combinational logic design– Multiplexers – Clocked sequential circuits – Two phase clocking – D-Flip-flop-Charge storage - Dynamic register element –Dynamic shift register

**UNIT IV PROGRAMMABLE LOGIC DEVICES****9**

Programmable Logic Devices – PLA , PAL – Finite State Machine design using PLA – Introduction to FPGA – FPGA Design flow –Architecture – FPGA devices: Xilinx XC 4000 – Altera cyclone III

**UNIT V VERILOG HDL DESIGN PROGRAMMING****9**

Basic concepts: VLSI Design flow, Modeling, Syntax and Programming, Design Examples:Combinational Logic – Multiplexer, Decoder/Encoder, Comparator, Adders, Multipliers, Sequential logic- Flip Flops, Registers, and Counters, Memory- Introduction to back end tools.

**TEXT BOOKS:**

1. Douglas A.Pucknell, K. Eshragian, "Basic VLSI Design", Third Edition,PHI,2009

**REFERENCE BOOKS:**

1. Neil.H.E.Weste,KamranEshraghian,"Principles of CMOS VLSI Design",Second Edition, AddisonWesleyPublications,2002
2. SamirPalnitkar, "VerilogHDL–GuidetoDigital Designand Synthesis",SecondEdition Pearson Education,2009
3. Wayne Wolf, "Modern VLSI Design",PearsonEducation , 2003
4. [https://en.wikipedia.org/wiki/Very-large-scale\\_integration](https://en.wikipedia.org/wiki/Very-large-scale_integration)

|               |  |          |          |          |          |
|---------------|--|----------|----------|----------|----------|
| <b>BEC703</b> | <b>CELLULAR MOBILE COMMUNICATION</b>                                     | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|               | Total Contact Hours – 45   | 3        | 0        | 0        | 3        |
|               | Prerequisite –Computer Communication and Networking                      |          |          |          |          |
|               | Course Designed by – Dept. of Electronics And Communication Engineering. |          |          |          |          |

|   |  |  |                             |                    |                        |                    |                         |                    |  |   |   |   |   |
|---|--|--|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|--|---|---|---|---|
| <b>OBJECTIVES</b>   |  |  |                             |                    |                        |                    |                         |                    |  |   |   |   |   |
| <ul style="list-style-type: none"> <li>To understand the basic cellular system concepts.</li> <li>To have an insight into the various propagation models and the speech coders used in mobile communication.</li> <li>To understand the multiple access techniques and interference education techniques in mobile communication..</li> </ul> |  |  |                             |                    |                        |                    |                         |                    |  |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |  |  |                             |                    |                        |                    |                         |                    |  |   |   |   |   |
| CO1   | Discuss cellular radio concepts                                |  |                             |                    |                        |                    |                         |                    |  |   |   |   |   |
| CO2   | Identify various propagation effects                           |  |                             |                    |                        |                    |                         |                    |  |   |   |   |   |
| CO3   | To have knowledge of the mobile system specifications.         |  |                             |                    |                        |                    |                         |                    |  |   |   |   |   |
| CO4   | Classify multiple access techniques in mobile communication.   |  |                             |                    |                        |                    |                         |                    |  |   |   |   |   |
| CO5   | Outline cellular mobile communication standards.               |  |                             |                    |                        |                    |                         |                    |  |   |   |   |   |
| CO6   | Analyze various methodologies to improve the cellular capacity |  |                             |                    |                        |                    |                         |                    |  |   |   |   |   |
| 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 | H |   | M |
|   | CO2  | M  | L                           | M                  |                        |                    |                         | H                  |  | L |   |   |   |
|   | CO3  | M  | H                           | M                  | L                      |                    | M                       | L                  |  |   |   | H |   |
|   | CO4  | M  | H                           |                    | M                      | H                  |                         | M                  | M  |   | M |   |   |
|   | CO5  |  | L                           |                    |                        |                    | M                       |                    |  |   | L |   |   |
|   | CO6  |  |                             |                    | M                      | 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 TO WIRELESS MOBILE COMMUNICATION 9

History and evolution of mobile radio systems, Types of mobile wireless services/systems – Cellular, WLL, Paging, Satellite systems, Standard, Future trends in personal wireless systems.

## UNIT II CELLULAR CONCEPT AND SYSTEM DESIGN FUNDAMENTALS 9

Cellular concept and frequency reuse, Multiple Access Schemes, Channel assignment and handoff, Interface and system capacity, Trunking and Erlang capacity calculations.

**UNIT III MOBILE RADIO PROPAGATION****9**

Radio wave propagation issues in personal wireless systems, Propagation models, Multipath fading and based and impulse models, Parameters of mobile multipath channels, Antenna systems in mobile radio.

**UNIT IV MODULATION AND SIGNAL PROCESSING****9**

Analog and digital modulation techniques, Performance of various modulation techniques – Spectral efficiency, Error rate, Power Amplification, Equalization/Rake receiver concepts, Diversity and Space-time processing, Speech coding and channel coding.

**UNIT V SYSTEM EXAMPLES AND DESIGN ISSUES****9**

Multiple Access Techniques – FDMA, TDMA and CDMA Systems, Operational Systems, Wireless networking, design issues in personal wireless systems.

**TEXT BOOKS:**

1. K. Feher, Wireless Digital Communication, Prentice Hall of India, New Delhi, 1995.

**REFERENCE BOOKS:**

- 1.T.S. Rappaport, Wireless Communication; Principles and Practice, Prentice Hall, NJ, 1996.
- 2.W.C.Y. Lee, Mobile Communication Engineering; Theory and Application, Second Edition, McGraw-Hill International, 1998.
- 3.[https://en.wikipedia.org/wiki/Cellular\\_network](https://en.wikipedia.org/wiki/Cellular_network)

**CORE ELECTIVE III**

| <b>BEC016</b>   | <b>COGNITIVE RADIO</b>   |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |   |
|---|--|---|---|---|---|---|----------|----------|----------|----------|---|---|---|
|   | Total Contact Hours – 45   |   |   |   |   |   | 3        | 0        | 0        | 3        |   |   |   |
|   | Prerequisite –Cellular Mobile Communication                                    |   |   |   |   |   |          |          |          |          |   |   |   |
|   | Course Designed by – Dept. of Electronics And Communication Engineering.       |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>OBJECTIVES:</b> 1.Learnthedesigntothewireless networksbasedonthecognitive radios<br>2. Understandtheconcepts of wireless networksand next generationnetworks.. |  |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |  |   |   |   |   |   |          |          |          |          |   |   |   |
| CO1   | Describe thebasicsofthe softwaredefinedradios.                                 |   |   |   |   |   |          |          |          |          |   |   |   |
| CO2   | To learn the hardware and software architecture of software defined radio      |   |   |   |   |   |          |          |          |          |   |   |   |
| CO3   | Designthewireless networksbasedonthecognitive radios.                          |   |   |   |   |   |          |          |          |          |   |   |   |
| CO4   | Gives an understanding of cognitive radio architecture                         |   |   |   |   |   |          |          |          |          |   |   |   |
| CO5   | Explain the concepts behind the wireless networks and next generation networks |   |   |   |   |   |          |          |          |          |   |   |   |
| CO6   | To have a better understanding of cognitive 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 | M        |          | H        | M        | H |   | M |

|   |          |  |   |                  |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
|---|----------|--|---|------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|---|--|
|   | CO2      | M  | M | M                |   | M                  |   | H                      |   |                    |   |                         | M |                    |  |   |  |
|   | CO3      | M  | H |                  | M |                    | M |                        |   |                    |   | H                       |   |                    |  |   |  |
|   | CO4      | M  | H |                  | L |                    |   | M                      | M |                    | M |                         |   |                    |  |   |  |
|   | CO5      |  | M | M                |   | H                  | M |                        | M | M                  |   | M                       | M |                    |  |   |  |
|   | CO6      |  |   |                  | M | H                  | H |                        |   | M                  |   |                         | M |                    |  |   |  |
| 3 | Category | Humanities & Social Studies (HS)                               |   | Basic Sciences & |   | 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 SOFTWARE DEFINED RADIO 9

Definitions and potential benefits, software radio architecture evolution, technology tradeoffs and architecture implications.

### UNIT II SDR ARCHITECTURE 9

Essential functions of the software radio, basic SDR, hardware architecture, Computational processing resources, software architecture, top level component interfaces, interface topologies among plug and play modules,.

### UNIT III INTRODUCTION TO COGNITIVE RADIOS 9

Marking radios self-aware, cognitive techniques – position awareness, environment awareness in cognitive radios, optimization of radio resources, Artificial Intelligence Techniques.

### UNIT IV COGNITIVE RADIO ARCHITECTURE 9

Cognitive Radio- functions, components and design rules, Cognition cycle-orient, plan, decide and act phases, Inference Hierarchy, Architecture maps, Building the Cognitive Radio Architecture on Software defined Radio Architecture.

### UNIT V NEXT GENERATION WIRELESS NETWORKS 9

The XG Network architecture, spectrum sensing, spectrum management, spectrum mobility, spectrum sharing, upper layer issues, cross-layer design.

#### TEXT BOOKS:

1. Joseph Mitola III, "Software Radio Architecture: Object-Oriented Approaches to Wireless System Engineering", John Wiley & Sons Ltd. 2000.
2. Thomas W. Rondeau, Charles W. Bostain, "Artificial Intelligence in Wireless Communication", ARTECH HOUSE. 2009.
3. Bruce A. Fette, "Cognitive Radio Technology", Elsevier, 2009.
4. Ian F. Akyildiz, Won-Yeol Lee, Mehmet C. Vuran, Shantidev Mohanty, "Next

generation/Dynamicspectrumaccess/cognitive radio wireless networks:A Survey”ElsevierComputer Networks, May, 2006.

**REFERENCE BOOKS:**

1. SimonHaykin, “Cognitive Radio:Brain–EmpoweredWireless Communications”, IEEE Journal onselectedareas in communications, Feb 2005.
2. Hasari Celebi,Huseyin Arslan, “EnablingLocationand Environment Awareness in CognitiveRadios”,ElsevierComputer Communications, Jan 2008.
- 3.Markus Dillinger, KambizMadani,NancyAlonistioti, “SoftwareDefined Radio”,JohnWiley,2003.
4. Huseyin Arslan,“Cognitive Radio,SDR andAdaptive System”, Springer, 2007.
5. AlexanderM.Wyglinski, Maziarnekovee,Y. Thomas Hu, “Cognitive Radio Communicationand Networks”,Elsevier, 2010
- 6.www.nptel.ac.in

|  |   |   |   |   |   |   |          |          |          |          |   |   |   |
|--|---|---|---|---|---|---|----------|----------|----------|----------|---|---|---|
| <b>BEC002</b>  | <b>INTEGRATED SERVICES DIGITAL NETWORK</b>                            |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |   |
|  | Total Contact Hours - 45  |   |   |   |   |   | 3        | 0        | 0        | 3        |   |   |   |
|  | Prerequisite –Computer Communication and Networks                     |   |   |   |   |   |          |          |          |          |   |   |   |
|  | Course Designed by – Dept. of Electronics & Communication Engineering |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>OBJECTIVES</b>  |   |   |   |   |   |   |          |          |          |          |   |   |   |
| <ul style="list-style-type: none"> <li>• To Study basic concepts of ISDN standards and services.</li> <li>• To develop knowledge in ISDN protocol Architecture and Signaling.</li> <li>• To Study concepts of Broad band ISDN</li> <li>• To have knowledge in Network performance Modeling and Estimation</li> </ul> |   |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>   |   |   |   |   |   |   |          |          |          |          |   |   |   |
| CO1  | To know the basics of ISDN,   |   |   |   |   |   |          |          |          |          |   |   |   |
| CO2  | Protocols involved in ISDN  |   |   |   |   |   |          |          |          |          |   |   |   |
| CO3  | To learn about Broad Band ISDN  |   |   |   |   |   |          |          |          |          |   |   |   |
| CO4  | To understand about network Management                                |   |   |   |   |   |          |          |          |          |   |   |   |
| CO5  | To Empower knowledge in Network Traffic Management                    |   |   |   |   |   |          |          |          |          |   |   |   |
| CO6  | To Estimate the Network Performance.                                  |   |   |   |   |   |          |          |          |          |   |   |   |
| 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        |          |          |          | M |   |   |
|  | CO2   | M | M | H |   |   |          |          | L        |          |   |   | M |
|  | CO3   | M |   | H | H | H |          | M        |          | H        |   |   | H |
|  | CO4   | M |   |   |   |   |          | L        |          |          |   | M |   |
|  | CO5   |   | M |   |   | M |          |          |          |          | M |   |   |

|   |          |  |                |                    |                        |                    |                         |                    |   |  |   |  |   |
|---|----------|--|----------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---|--|---|--|---|
|   | CO6      |  | M              | H                  |                        |                    | H                       |                    |   |  | M |  | M |
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences | 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 ISDN – STANDARDS AND SERVICES: 9**

Review of switching technologies and OSI protocol architecture, ISDN channels, access interfaces, functional devices and standards, ISDN bearer services and teleservice attribute, Broadband services.

**UNIT II ISDN PROTOCOL ARCHITECTURE AND SIGNALING 9**

Physical layer protocol, D-channel datalink layer and layer 3 protocols, Network signaling systems, SS7 protocol overview and services, ISDN products, Switches, Multiplexers, Terminal adapters, ISDN chip sets.

**UNIT III BROAD BAND ISDN 9**

Frame Relay – concepts, protocols, applications and products, asynchronous transfer mode – concepts, protocols, application and products, switched multi megabit data service, Internetprotocol over ISDN frame relay and ATM.

**UNIT IV NETWORK TRAFFIC MANAGEMENT 9**

ATM traffic and congestion control, Traffic management framework, control mechanism and attributes, ABR traffic management

**UNIT V NETWORK PERFORMANCE MODELING AND ESTIMATION 9**

Queueing analysis, single server and multi server queues, Networks of Queues, Estimatingmodel parameters, Self-similar traffic – performance implication, modeling and estimation

**TEXT BOOKS:**

- 1.Gary C. Kessler and Peter Southwick, “ISDN – Concepts, Facilities and Services”, McGraw Hill, 3rd Edition, 1997.
- 2.William Stallings, “High Speed Networks-TCP/IP and ATM Design Principles”, Prentice Hall Inc., 1998.

**REFERENCE BOOKS:**

1. William Stallings , “High-Speed Networks and Internets: Performance and Quality of Service” (2nd Edition) , 2002
2. Balaji Kumar, “Broad Band Communications” McGraw-Hill, 1995
3. [www.faadooengineers.com](http://www.faadooengineers.com)

|  |  |          |          |          |          |
|--|--|----------|----------|----------|----------|
| <b>BEC007</b>  | <b>DIGITAL IMAGE PROCESSING</b>  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|  | Total Contact Hours – 45   | 3        | 0        | 0        | 3        |
|  | Prerequisite – Fourier Transform and Complex Variables or equivalent     |          |          |          |          |
|  | Course Designed by – Dept. of Electronics And Communication Engineering. |          |          |          |          |
| <b>OBJECTIVES</b>  |  |          |          |          |          |
| <ul style="list-style-type: none"> <li>• To study the image fundamentals and mathematical transforms necessary for image processing.</li> <li>• To study the image enhancement techniques</li> <li>• To study image restoration procedures.</li> <li>• To study the image compression procedures.</li> </ul> |  |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>   |  |          |          |          |          |
| CO1  | Review the fundamental concepts of a digital image processing system     |          |          |          |          |
| CO2  | Analyze images in the frequency domain using various transforms          |          |          |          |          |
| CO3  | Evaluate the techniques for image enhancement and image restoration      |          |          |          |          |
| CO4  | Categorize various compression techniques.                               |          |          |          |          |
| CO5  | Interpret Image compression standards                                    |          |          |          |          |
| CO6  | Interpret image segmentation and representation techniques.              |          |          |          |          |

**UNIT I DIGITAL IMAGE FUNDAMENTAL 9**

Elements of digital image processing systems, Elements of Visual perception, Image sampling and quantization, Matrix and Singular Value representation of discrete images.

**UNIT II IMAGE TRANSFORMS 9**

1D DFT, 2D DFT, Cosine, Sine Hadamard, Haar, Slant, KL, SVD transform and their properties.

**UNIT III IMAGE ENHANCEMENT 9**

Histogram – Modification and specification techniques Image smoothing, Image sharpening, generation of spatial masks from frequency domain specification, Nonlinear filters, Homomorphism filtering, false color, Pseudo color and color image processing.

**UNIT IV IMAGE RESTORATION AND RECOGNITION 9**

Image DEGRADATION models, Unconstrained and Constrained restoration, inverse filtering, Least mean square filter, Pattern Classes, optimal statistical classifiers, Neural networks and associated training methods and use of neural networks in image processing.

**UNIT V IMAGE COMPRESSION 9**

Run length, Huffman coding, Shift codes, arithmetic coding, bit plane coding, transform coding, JPEG Standard, wavelet transform, predictive techniques, Block truncation coding schemes, Facet modeling.

**TEXT BOOKS:**

1. Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2010

**REFERENCE BOOKS:**

- 1.Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, Third Edition Tata McGraw Hill Pvt. Ltd., 2011.
2. Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.
3. William K Pratt, “Digital Image Processing”, John Willey, 2002.
4. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, First Edition, HILearning Pvt. Ltd., 2
5. [www.tutorialspoint.com/dip/](http://www.tutorialspoint.com/dip/)

|  |   |  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |
|--|---|--|---|---|---------------------|---|--------------------|---|------------------------|---|--------------------|----------|-------------------------|----------|--------------------|--|
| <b>BEC003</b>  | <b>SATELLITE COMMUNICATION</b>  |  |   |   |                     |   |                    |   |                        |   |                    | <b>L</b> | <b>T</b>                | <b>P</b> | <b>C</b>           |  |
|  | Total Contact Hours – 45  |  |   |   |                     |   |                    |   |                        |   |                    | 3        | 0                       | 0        | 3                  |  |
|  | Prerequisite –Communication Engineering II and Electromagnetic Fields and waves |  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |
|  | Course Designed by – Dept. of Electronics and Communication Engineering.        |  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |
| <b>OBJECTIVES</b>  |   |  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |
| <ul style="list-style-type: none"> <li>• To enable the student to become familiar with satellites and satellite services.</li> <li>• Study of satellite orbits and launching.</li> <li>• Study of earth segment and space segment components</li> <li>• Study of satellite access by various users.</li> </ul> |   |  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |
| <b>COURSE OUTCOMES (COs)</b>   |   |  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |
| CO1  | Define orbital mechanics and launch methodologies                               |  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |
| CO2  | Describe satellite subsystems   |  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |
| CO3  | Design link power budget for satellites   |  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |
| CO4  | Compare competitive satellite services  |  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |
| CO5  | Explain satellite access techniques   |  |   |   |                     |   |                    |   |                        |   |                    |          |                         |          |                    |  |
| CO6  | DTH and compression 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 |                     | M | M                  | M | H                      | M |                    | L        |                         |          |                    |  |
|  | CO2   | M  | L | H |                     |   |                    | H |                        | L | H                  |          |                         |          |                    |  |
|  | CO3   | M  | H | M |                     |   |                    | M | M                      | M |                    | H        | H                       |          |                    |  |
|  | CO4   | M  | H | H |                     | M |                    |   |                        | M |                    | M        | M                       |          |                    |  |
|  | CO5   |  | L |   |                     | M | M                  | M |                        | L |                    | M        | M                       |          |                    |  |
|  | CO6   |  |   |   | M                   | M | H                  | M |                        |   |                    |          |                         |          |                    |  |
| 3  | Category  | Humanities & Social Studies (HS)                               |   |   | Basic Sciences (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**

Introduction, Types – Active and Passive Satellite, Frequency allocation, Satellite orbits, Kepler's laws, Definitions of terms for earth-orbiting Satellites, Apogee and Perigee heights, Orbit Perturbations, Geo stationary orbit, Antenna look angles, Limits of visibility, Earth Eclipse of Satellite, Sun transit outage, launching orbits.

## **UNIT II THE SPACE SEGMENT**

**9**

Introduction, The Power supply, Attitude control, Spinning satellite, stabilization, Momentum Wheel Stabilization, Station keeping, Thermal control, TT&C subsystem, Transponders, The Wide Band receiver, The Input Demultiplexer, The Power Amplifier, The Antenna subsystem.

## **UNIT III THE EARTH SEGMENT AND ANTENNAS**

**9**

Transmit receive earth station subsystems, up-converters-High Power Amplifier-Receive chain-LNA&LNB.TVRO earth station, The isotropic radiator and antenna gain, Horn antenna, The Parabolic reflector, Double reflector antenna-Cassegrain antenna-Gregorian antenna.

## **UNIT IV THE SPACE LINK & SATELLITE ACCESS**

**9**

EIRP, Transmission losses The Link budget equation, System noise, Effects of rain, up link and down link C/N ratio. Multiple access techniques-Concepts and types of TDMA, FDMA and CDMA-Comparison and contrast of TDMA, FDMA and CDMA.

## **UNIT V SATELLITE APPLICATIONS**

**9**

Satellite Mobile services, DBS, VSAT, Remote sensing, GPS, INTELSAT, INMARSAT, SARSAT, Video Conferencing and Internet connectivity

### **TEXT BOOKS:**

2. Dennis Roddy, "Satellite Communication", 4<sup>th</sup> Edition, McGrawHill International, 2006.

### **REFERENCE BOOKS:**

1. Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, "Satellite Communication Systems Engineering", Prentice Hall/Pearson, 2007.
2. N. Agarwal, "Design of Geosynchronous Space Craft", Prentice Hall, 1986.
3. Bruce R. Elbert, "The Satellite Communication Applications", Hand Book, Artech House Boston London, 1997.
4. Tri T. Ha, "Digital Satellite Communication", II<sup>nd</sup> Edition, 1990.
5. Emanuel F Thenakis, "Manual of Satellite Communications", McGrawHill Book Co., 1984.
6. Robert G. Winch, "Telecommunication Transmission Systems", McGraw-Hill Book Co., 1983.
7. Brian Ackroyd, "World Satellite Communication and Earth Station Design", BSP Professional Books, 1990.
8. G. B. Bleazard, "Introducing Satellite communications", NCC Publication, 1985.
9. [www.sac.gov.in/SACSITE/Satcom\\_Overview.doc](http://www.sac.gov.in/SACSITE/Satcom_Overview.doc)

### NON MAJOR ELECTIVE-I

|   |   |  |   |                       |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
|---|---|--|---|-----------------------|---|--------------------|----------|------------------------|----------|--------------------|---|-------------------------|---|--------------------|--|---|--|
| <b>BCS 603</b>  | <b>ARTIFICIAL INTELLIGENCE &amp; EXPERT SYSTEMS</b>   |  |   |                       |   | <b>L</b>           | <b>T</b> | <b>P</b>               | <b>C</b> |                    |   |                         |   |                    |  |   |  |
|   | Total Contact Hours - 45  |  |   |                       |   | 3                  | 0        | 0                      | 3        |                    |   |                         |   |                    |  |   |  |
|   | Prerequisite –Data Structures, Design and Analysis of Algorithm.  |  |   |                       |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
|   | Course Designed by – Dept. of Computer Science and Engineering.   |  |   |                       |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| <b>OBJECTIVES</b>   |   |  |   |                       |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| The purpose of this course is to impart concepts of Artificial Intelligence and Expert System.                              |   |  |   |                       |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| <b>COURSE OUTCOMES (COs)</b>  |   |  |   |                       |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| CO1   | Describe the modern view of AI as the study of agents that receive percepts from the Environment and perform actions. |  |   |                       |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| CO2   | Demonstrate awareness of informed search and exploration methods.   |  |   |                       |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| CO3   | Explain about AI techniques for knowledge representation, planning and uncertainty Management.                        |  |   |                       |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| CO4   | Develop knowledge of decision making and learning methods.  |  |   |                       |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| CO5   | Describe the use of AI to solve English Communication problems.   |  |   |                       |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| CO6   | Explain the concept Knowledge Representation.   |  |   |                       |   |                    |          |                        |          |                    |   |                         |   |                    |  |   |  |
| 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        |                        |          |                    |   |                         | M |                    |  |   |  |
|   | CO3   |  |   |                       | H |                    | M        | M                      |          |                    |   |                         |   |                    |  |   |  |
|   | CO4   |  | M |                       | H |                    |          |                        |          |                    |   |                         | M |                    |  |   |  |
|   | CO5   | M  |   |                       | H |                    | H        |                        |          |                    |   |                         |   |                    |  |   |  |
|   | CO6   | L  | M |                       | M |                    | M        |                        |          |                    |   |                         |   | H                  |  |   |  |
| 3   | Category  | Humanities & Social Studies (HS)                               |   | Basic Sciences & (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 PROBLEMS AND SEARCH

9

Searching strategies- Uninformed Search- breadth first search, depth first search, uniform cost search, depth limited search, iterative deepening search, bidirectional search - Informed Search-

Best first search, Greedy Best first search, A\* search – Constraint satisfaction problem , Local searching strategies.

**UNIT II REASONING 9**

Symbolic Reasoning Under Uncertainty- Statistical Reasoning - Weak Slot-And-Filler-Structure - Semantic nets – Frames- Strong Slot-And-Filler Structure-Conceptual Dependency-Scripts-CYC.

**UNIT III KNOWLEDGE REPRESENTATION 9**

Knowledge Representation - Knowledge representation issues - Using predicate logic - Representing Knowledge Using Rules. Syntactic- Semantic of Representation – Logic & slot and filler - Game Playing – Minimal search- Alpha beta cutoffs –Iteratic deepening planning – component of planning system – Goal stack planning.

**UNIT IV NATURAL LANGUAGE PROCESSING 9**

Natural Language Processing –Syntactic processing, semantic analysis-Parallel and Distributed AI-Psychological modeling- parallelism and distributed in reasoning systems – Learning - Connectionist Models – Hopfield networks, neural networks

**UNIT V EXPERT SYSTEMS 9**

Common Sense –qualitative physics, commonsense ontologies- memory organization -Expert systems –Expert system shells- explanation – Knowledge acquisition -Perception and Action – Real time search- robot architecture.

**TEXT BOOKS:**

1. Elaine Rich, Kevin Knight, “Artificial Intelligence”, 3/e, Tata McGraw Hill, 2009.
2. Russell , “ Artificial intelligence :A modern Approach , Pearson Education ,3<sup>rd</sup> edition,2013

**REFERENCE BOOKS:**

1. Artificial Intelligence and Expert system by V.Daniel hunt, Springer press,2011.
2. Nilsson N.J.,”Principles of Artificial Intelligence”, Morgan Kaufmann.1998.
3. <http://www.ggu.ac.in/download/Class-Note13/Artificial%20Intelligence%20and%20Expert%20System24.10.13.pdf>

|  |  |   |   |   |   |
|--|--|---|---|---|---|
| <b>BBM054</b>  | <b>BIOINFORMATICS</b>                                  |   |   |   |   |
|  | Total Contact Hours - 45                               | 3 | 0 | 0 | 3 |
|  | Prerequisite –Biology for Engineers.                   |   |   |   |   |
|  | Course Designed by – Dept. of Bio Medical Engineering. |   |   |   |   |
| <b>OBJECTIVES</b>  |  |   |   |   |   |
| <ul style="list-style-type: none"> <li>To introduce Bioinformatics-Elementary commands and Protocols, ftp, telnet, http. Primer on information theory</li> </ul> |  |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>   |  |   |   |   |   |
| CO1  | To learn bioinformatics and the protocols.             |   |   |   |   |

|   |  |  |   |                     |   |                    |   |                        |   |                    |   |   |   |
|---|--|--|---|---------------------|---|--------------------|---|------------------------|---|--------------------|---|---|---|
| CO2   | To learn Strings-Edit distances two strings-string similarity local alignment gaps-parametric sequence alignments. |  |   |                     |   |                    |   |                        |   |                    |   |   |   |
| CO3   | To have a clear view on Amino acid substitution matrices PAM and BLOSSUM.  |  |   |                     |   |                    |   |                        |   |                    |   |   |   |
| CO4   | To learn Ultrasonic trees-parsimony-Ultrametric problem-perfect phylogeny-phylogenetic alignment.                  |  |   |                     |   |                    |   |                        |   |                    |   |   |   |
| CO5   | To DNA Mapping and sequencing-Map alignment-Large scale sequencing.  |  |   |                     |   |                    |   |                        |   |                    |   |   |   |
| CO6   | DNA Mapping and sequencing-Map alignment-Large scale sequencing and 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  |  |   | H                   |   |                    |   |                        |   |                    |   |   |   |
|   | CO2  |  |   | H                   | H |                    | M |                        |   |                    |   |   |   |
|   | CO3  |  | M |                     | H |                    | H |                        |   |                    |   |   |   |
|   | CO4  | H  | M |                     | H |                    |   |                        |   |                    |   |   |   |
|   | CO5  |  |   | H                   |   | H                  |   |                        |   |                    |   |   |   |
|   | CO6  |  |   |                     |   |                    |   |                        |   |                    |   |   |   |
| 3   | Category   | Humanities & Social Studies (HS)                               |   | Basic Sciences (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 BIOINFORMATICS

9

Scope of Bioinformatics-Elementary commands and Protocols, ftp, telnet, http.Primer on information theory.

### UNIT – II SEQUENCING ALIGNMENT AND DYNAMIC PROGRAMMING

9

Introduction-Strings-Edit distance two strings-string similarity local alignment gaps-parametric sequence alignments-suboptimal alignments-multiple alignment-common multiple alignment methods.

### UNIT – III SEQUENCE DATABASE AND THEIR USE

9

Introduction to databases-database search-Algorithms issues in database search-sequence database searchFASTA-BLAST-Amino acid substitution matrices PAM and BLOSSUM.

### UNIT – IV EVOLUTIONARY TREES AND PHYLOGENY

9

Ultrasonic trees-parsimony-Ultrametric problem-perfect phylogeny-phylogenetic alignment-connection between multiple alignment and tree construction.

**UNIT – V SPECIAL TOPICS IN BIOINFORMATICS****9**

DNA Mapping and sequencing-Map alignment-Large scale sequencing and alignment-Shotgun-DNA sequencing-Sequence assembly-Gene predictions-Molecular predictions with DNA strings.

**TEXT BOOKS:**

1.R.D.Lele “Computer in Medicine” Tata McGraw Hill, New York, 1999.

**REFERENCE BOOKS:**

1.S.K.Chauhan “PC Organisation”, S.K.Kataria and Sons, Delhi 2000.

2. Harold Sackam “Bio Medical Information Technology”, Academic Press, New York.

3.[https://www.lehigh.edu/~inbios21/PDF/Fall2008/Lopresti\\_11142008.pdf](https://www.lehigh.edu/~inbios21/PDF/Fall2008/Lopresti_11142008.pdf)

| <b>BEI605</b>   | <b>EMBEDDED SYSTEM DESIGN</b>  |   |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |
|---|--|---|---|---|---|---|---|----------|----------|----------|----------|---|---|
|   | Total Contact Hours - 45   |   |   |   |   |   |   | 3        | 0        | 0        | 3        |   |   |
|   | Prerequisite – Microprocessor and Microcontroller  |   |   |   |   |   |   |          |          |          |          |   |   |
|   | Course Designed by – Dept of Electronics & Instrumentation Engineering                     |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>OBJECTIVES</b>   |  |   |   |   |   |   |   |          |          |          |          |   |   |
| <ul style="list-style-type: none"> <li>To introduce the Building Blocks of Embedded System</li> <li>To Educate in Various Embedded Development Strategies</li> <li>To Introduce Bus Communication in processors, Input/output interfacing.</li> <li>To impart knowledge in various processor scheduling algorithms.</li> <li>To introduce Basics of Real time operating system and example tutorials to discuss on one real time operating system tool</li> </ul> |  |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |  |   |   |   |   |   |   |          |          |          |          |   |   |
| CO1   | Acquire a basic knowledge about fundamentals of microcontrollers                           |   |   |   |   |   |   |          |          |          |          |   |   |
| CO2   | Acquire a basic knowledge about programming and system control to perform a specific task. |   |   |   |   |   |   |          |          |          |          |   |   |
| CO3   | Acquire knowledge about devices and buses used in embedded networking                      |   |   |   |   |   |   |          |          |          |          |   |   |
| CO4   | Develop programming skills in embedded systems for various applications.                   |   |   |   |   |   |   |          |          |          |          |   |   |
| CO5   | Acquire knowledge about basic concepts of REAL Time Operating Systems                      |   |   |   |   |   |   |          |          |          |          |   |   |
| CO6   | Build complex embedded system with the use of RTOS.  |   |   |   |   |   |   |          |          |          |          |   |   |
| 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 | M |   | M        |          |          | L        | L | M |
|   | CO2  | H | M | M | H | H |   | M        |          |          | L        | L | M |
|   | CO3  | H | M |   | H | H |   | M        |          |          | L        | L | M |
|   | CO4  | H | M |   | H | H |   | M        |          |          | L        | L | M |
|   | CO5  | H | M | M | H | H |   | M        |          |          | L        | L | M |
|   | CO6  | H |   |   | H | H |   | M        |          |          | L        | L | M |

|   |          |  |                     |                     |                        |                    |                         |                    |   |
|---|----------|--|---------------------|---------------------|------------------------|--------------------|-------------------------|--------------------|---|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences (BS) | Basic 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 EMBEDDED DESIGN WITH MICROCONTROLLERS 9**

Product specification – Hardware / Software partitioning – Detailed hardware and software design – Integration – Product testing – Microprocessor Vs Micro Controller – Performance tools– RTOS Micro Controller -issues in selection of processors.

**UNIT-II PARTITIONING DECISION 9**

Hardware / Software duality – Hardware-Software portioning- coding for Hardware- software development – ASIC revolution – Managing the Risk – Co-verification – execution environment – memory organization –memory enhancement – Firmware-speed and code density -System startup.

**UNIT-III FUNCTIONALITIES FOR SYSTEM DESIGN 9**

Timers, Watch dog timers – RAM, Flash Memory basic toolset – Integration of Hardware & Firmware- in System Programming, in Application Programming, IDE-Target Configuration- Host based debugging – Remote debugging – ROM emulators – Logic analyzer.

**UNIT-IV CIRCUIT EMULATORS 9**

Buller proof run control – Real time trace – Hardware break points – Overlay memory – Timing constraints – Usage issues – Triggers.

**UNIT-V EMBEDDED DESIGN LIFE CYCLE & TESTING 9**

Objective, Need, different Phases & Modeling of the EDLC, choice of Target Architectures for Embedded Application Development-for Control Dominated-Data Dominated Systems-Software &Hardware Design, PCB Design, Manufacturing & PCB Assembly-Bug tracking – reduction of risks & costs – Performance – Unit testing – Regression testing – Choosing test cases – Functional tests – Coverage tests – Testing embedded software – Performance testing – Maintenance.

**TEXT BOOKS:**

1. James K.Peckol, “Embedded system Design”, John Wiley & Sons, 2010

**Reference:**

1. Elicia White, “Making Embedded Systems”, O’Reilly Series, SPD, 2011
2. Rajkamal,”Embedded Systems”, TMH, 2009.
3. Lyla B Das,” Embedded Systems-An Integrated Approach”, Pearson2013
5. Arnold S. Berger –“Embedded System Design”, CMP books, USA 2002

|   |   |  |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
|---|---|--|-----------------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---|----------|---|---|---|
| <b>BCS702</b>   | <b>MOBILE AND PERVASIVE COMPUTING</b>                                     |  |                             |                    |                        |                    | <b>L</b>                | <b>T</b>           | <b>P</b>                                    | <b>C</b> |   |   |   |
|   | Total Contact Hours - 45  |  |                             |                    |                        |                    | 3                       | 0                  | 0   | 3        |   |   |   |
|   | Prerequisite –Computer Networks, Distributed Computing.                   |  |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
|   | Course Designed by – Dept. of Computer Science and Engineering.           |  |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
| <b>OBJECTIVES</b>   |   |  |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
| This course discuss about knowledge and skills about a new trend in mobile Computing.                                       |   |  |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |   |  |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
| CO1   | Explain the concepts and features of mobile networks.                     |  |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
| CO2   | Explain the working of wireless communication protocols.                  |  |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
| CO3   | Compare the routing protocols of mobile networks.                         |  |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
| CO4   | Explain the transport and application layer protocols of mobile networks. |  |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
| CO5   | Outline the basics of pervasive computing.                                |  |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
| CO6   | Learn the Concept of GSM,GPRS.  |  |                             |                    |                        |                    |                         |                    |   |          |   |   |   |
| 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                  |                        |                    |                         |                    |   |          |   |   |   |
|   | CO3   |  |                             | H                  |                        |                    |                         |                    | M   |          |   |   |   |
|   | CO4   |  |                             | H                  |                        |                    |                         |                    |   |          |   |   | M |
|   | CO5   | M  |                             | M                  |                        |                    |                         |                    |   |          |   |   |   |
|   | CO6   |  |                             |                    |                        |                    |                         |                    | 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 MOBILE NETWORKS**

**9**

Cellular Wireless Networks – GSM – Architecture – Protocols – connection establishment –Frequency Allocation – Routing – Mobility Management – Security – GPRS.

**UNIT II WIRELESS NETWORKS**

**9**

Wireless LANs and PANs – IEEE 802.11 Standard – Architecture – Services – Network – HiperLAN – BlueTooth- Wi-Fi – WiMAX.

**UNIT III ROUTING**

**9**

Mobile IP – DHCP – AdHoc– Proactive and Reactive Routing Protocols – MulticastRouting.

**UNIT IV TRANSPORT AND APPLICATION LAYERS****9**

Mobile TCP– WAP – Architecture – WWW Programming Model– WDP – WTLS – WTP – WSP – WAE – WTAArchitecture – WML – WMLScripts.

**UNIT V PERVASIVE COMPUTING****9**

Pervasivecomputing infrastructureapplications- Device Technology-Hardware, Humanmachine interfaces, Biometric, and Operating systems-Devices Connectivity-Protocols, Security, and Devices Management-Pervasive Web Application Architecture, Access from PCs and PDAs – Access via WAP.

**TEXT BOOKS:**

1. Jochen Schiller, “Mobile Communications”, PHI, Second Edition, 2003.
2. Jochen Burkhardt, Pervasive Computing: Technology and Architecture of MobileInternet Applications, Addison Wesley Professional; 3<sup>rd</sup> edition 2007.

**REFERENCE BOOKS:**

- 1.Frank Adelstein, Sandeep KS Gupta, Golden Richard, Fundamentals of Mobile and Pervasive Computing, McGraw-Hill 2005
2. Debashis Saha, Networking Infrastructure for Pervasive Computing: EnablingTechnologies, Kluwer Academic Publisher, Springer; 1<sup>st</sup> edition, 2002
3. Introduction to Wireless and Mobile Systems by Agrawal and Zeng, Brooks/ Cole(Thomson Learning),1<sup>st</sup> Edition, 2002
- 4.Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, Principlesof Mobile Computing, Springer, New York, 2003.
- 5.[http://media.techtarget.com/searchMobileComputing/downloads/Mobile\\_and\\_pervasive\\_computing\\_Ch06.pdf](http://media.techtarget.com/searchMobileComputing/downloads/Mobile_and_pervasive_computing_Ch06.pdf)

**NON MAJOR ELECTIVE-II**

|  |  |          |          |          |          |
|--|--|----------|----------|----------|----------|
| <b>BCS701</b>  | <b>GRID AND CLOUD COMPUTING</b>  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|  | Total Contact Hours – 45   | 3        | 0        | 0        | 3        |
|  | Prerequisite –Computer Networks, Distributed Computing, Data ware Housing and Data Mining.                   |          |          |          |          |
|  | Course Designed by – Dept. of Computer Science and Engineering.  |          |          |          |          |
| <b>OBJECTIVES</b>  |  |          |          |          |          |
| <ul style="list-style-type: none"> <li>• Identify the technical foundations of cloud systems architectures.</li> <li>• Analyze the problems and solutions to cloud application problems.</li> <li>• Apply principles of best practice in cloud application design and management.</li> <li>• Identify and define technical challenges for cloud applications and assess their importance.</li> </ul> |  |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>   |  |          |          |          |          |
| CO1  | Understand the fundamental principles of distributed computing.  |          |          |          |          |
| CO2  | Understand how the distributed computing environments known as Grids can be built from lower level services. |          |          |          |          |

|   |   |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
|---|---|--|---|---------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|---|--|
| CO3   | Understand the importance of virtualization in distributed computing and how this has enabled the development of Cloud Computing. |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO4   | Analyze the performance of Cloud Computing.   |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO5   | Understand the concept of Cloud Security.   |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| CO6   | Learn the Concept of Cloud Infrastructure Model.  |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| 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 | M                  |   |                        |   |                    |   | H                       |   |                    |  |   |  |
|   | CO2   |  |   | H                   |   |                    |   |                        | M | M                  |   |                         | H |                    |  |   |  |
|   | CO3   | M  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
|   | CO4   |  | M | M                   |   |                    |   |                        |   |                    |   | H                       |   |                    |  |   |  |
|   | CO5   |  |   |                     | M | M                  |   |                        |   |                    |   |                         | M |                    |  |   |  |
|   | CO6   | M  | M | H                   |   |                    |   |                        |   | M                  |   |                         | M |                    |  |   |  |
| 3   | Category  | Humanities & Social Studies (HS)                               |   | Basic Sciences (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 GRID COMPUTING

9

Introduction - Definition and Scope of grid computing, Computational and Data Grids, Current Grid Activities – Overview of Grid Business Areas, Grid Applications, Grid Computing Anatomy- Concept of Virtual Organization, Grid Architecture- Fabric layer, Connectivity layer, Resource Layer, Collective Layer, Application Layer, Layered Grid Architecture

### UNIT II CLOUD ARCHITECTURE AND MODEL

9

Technologies for Network Based system-System Models for Distributed and Cloud Computing-NIST Cloud Computing Reference ArchitectureCloud models: Characteristics-Cloud Services-Cloud Models (IaaS, PaaS, SaaS)-Public vs. Private Cloud-Cloud Solutions-Cloud ecosystem-Service Management-Computing on demand.

### UNIT III CLOUD INFRASTRUCTURE

9

Architectural Design of compute and Storage Clouds-Layered Cloud Architecture Development-Design Challenges-Inter Cloud Resource Management-Resource Provisioning and Platform Deployment-Global Exchange of Cloud Resources.

### UNIT IV PROGRAMMING MODEL

9

Parallel and Distributed Programming Paradigms-Map Reduce-Map Reduce and Iterative Map Reduce-Hadoop Library from Apache-Mapping Applications-Programming Support-Google

App Engine, Amazon AWS-Cloud Software Environments-Eucalyptus, Open Nebula, Open Stack, Aneka, CloudSim.

**UNIT V SECURITY IN THE CLOUD**

**9**

Security Overview-Cloud Security Challenges and Risks-Software-as-a-Service-Security Security Governance-Risk Management-Security Monitoring-Security Architecture Design-Data Security-Application Security-Virtual Machine Security-Identity Management and Access Control-Autonomic Security.

**TEXT BOOKS:**

1. Joshy Joseph & Craig Fellenstein, “Grid Computing”, PHI, PTR-2003(UNIT I)
2. Kai Hwang, Geoffrey C Fox, Jack G Dongarra “Distributed and Cloud Computing ,From parallel processing to the Internet of Things” Morgan Kaufmann Publishers,2012(Unit-II to Unit-V)

**REFERENCE BOOKS:**

1. John W. Rittinghouse and James F. Ransome, “Cloud Computing Implementation, Management and Security”, CRC Press, 2010
2. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach”, TMH, 2009.
3. Kumar Saurabh, “Cloud Computing –Insights into New-Era Infrastructure “, Wiley India, 2011
4. George Reese, “Cloud Applications Architectures: Building Applications and Infrastructure in the Cloud” O’Reilly.
5. <https://benzology.files.wordpress.com/2013/05/grid-computing-joshy-joseph-ebook.pdf>
6. [http://cloudipedia.com/files/2009/11/cloud\\_computing\\_made\\_easy.pdf](http://cloudipedia.com/files/2009/11/cloud_computing_made_easy.pdf)

|  |  |  |  |          |          |          |          |
|--|--|--|--|----------|----------|----------|----------|
| <b>BCS008</b>  | <b>DISTRIBUTED OPERATING SYSTEM</b>  |  |  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|  | Total Contact Hours – 45   |  |  | 3        | 0        | 0        | 3        |
|  | Prerequisite –Fundamentals of Computing and Programming, Operating System, Parallel Computing.   |  |  |          |          |          |          |
|  | Course Designed by – Dept. of Computer Science and Engineering.  |  |  |          |          |          |          |
| <b>OBJECTIVES</b>  |  |  |  |          |          |          |          |
| <ul style="list-style-type: none"> <li>• To provide hardware and software issues in modern distributed systems.</li> <li>• To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.</li> <li>• To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.</li> </ul> |  |  |  |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>   |  |  |  |          |          |          |          |
| CO1  | To provide hardware and software issues in modern distributed systems.   |  |  |          |          |          |          |
| CO2  | To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems. |  |  |          |          |          |          |
| CO3  | To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.   |  |  |          |          |          |          |
| CO4  | To know about Shared Memory Techniques.  |  |  |          |          |          |          |
| CO5  | Have Sufficient knowledge about file access.   |  |  |          |          |          |          |

|   |   |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
|---|---|--|---|---------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|---|--|
| CO6   | Have knowledge of Synchronization and Deadlock. |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
| 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 |                    |  |   |  |
|   | CO2   |  | H | H                   | M |                    |   |                        |   |                    |   |                         | H |                    |  |   |  |
|   | CO3   | L  | M | H                   |   |                    |   |                        |   |                    |   |                         | H |                    |  |   |  |
|   | CO4   |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
|   | CO5   |  | M | M                   | H |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |
|   | CO6   | M  | M | H                   | M |                    |   |                        |   |                    |   |                         |   | M                  |  |   |  |
| 3   | Category  | Humanities & Social Studies (HS)                               |   | Basic Sciences (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 MODES OF COMMUNICATION 9**

System Process, Interrupt Handling, Handling Systems calls, Protection of resources & Resources Management Micro-Kernel Operating System.

**UNIT II REVIEW OF NETWORK OPERATING SYSTEM9**

Distributed Operating System, Issue in the design of Distributed Operating System, Overview of Computer Networks. Inter process communication, Linux, IPC Mechanism, Remote Procedure calls, RPC exception handling, Security issues, RPC in Heterogeneous Environment (case study Linux RPC)

**UNIT III RESOURCE MANAGEMENT 9**

Clock Synchronization, Logical clocks, Physical clocks, clock synchronization algorithms, Mutual Exclusion, Election Algorithms, Dead locks in Distributed Systems. Thrashing, Heterogeneous DSM, Resource Management (Load Balancing approach, Load Sharing approach), Process Management: process Migration, Thread.

**UNIT IV OVERVIEW OF SHARED MEMORY 9**

Consistency model, Page based Distributed Shared Memory, Shared –variable Distributed Memory, Object -based Distributed Memory.

**UNIT V FILE MODELS 9**

File access, File sharing, file-caching, File Replication, fault Tolerance, Network File System, (Case study, 8NFS on Linux Directory Services, Security in Distributed File system).

**TEXT BOOKS:**

1. M. Beck et al,” Linux Kernel Programming”,3<sup>rd</sup> edition, 2002.
2. B.W. Kernighan and R Pide, “The Unix Programming Environment “, Prentice Hall of India-2000.

**REFERENCE BOOKS:**

1. Silberschatz,P.B.Garvin,Gagne,” Operating System Concepts”, 2009.
2. <https://www.cs.columbia.edu/~smb/classes/s06-4118/126.pdf>

|  |  |   |   |   |   |   |          |          |          |          |   |   |   |
|--|--|---|---|---|---|---|----------|----------|----------|----------|---|---|---|
| <b>BCS002</b>  | <b>NEURAL NETWORKS</b>   |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |   |
|  | Total Contact Hours – 45   |   |   |   |   |   | 3        | 0        | 0        | 3        |   |   |   |
|  | Prerequisite –Mathematics-I, Mathematics-II, Numerical Methods, Discrete Mathematics                             |   |   |   |   |   |          |          |          |          |   |   |   |
|  | Course Designed by – Dept. of Computer Science and Engineering.  |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>OBJECTIVES</b>  |  |   |   |   |   |   |          |          |          |          |   |   |   |
| <ul style="list-style-type: none"> <li>• Basic neuron models: McCulloch-Pitts model and the generalized one, distance or similarity based neuron model, radial basis function model, etc.</li> <li>• Basic neural network models: multilayer perceptron, distance or similarity based neural networks, associative memory and self-organizing feature map, radial basis function based multilayer perceptron, neural network decision trees, etc.</li> </ul> |  |   |   |   |   |   |          |          |          |          |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>   |  |   |   |   |   |   |          |          |          |          |   |   |   |
| CO1  | Be able to analyze a problem for NN solution in terms of these methods.  |   |   |   |   |   |          |          |          |          |   |   |   |
| CO2  | Have an awareness of the computational theory underlying NN.   |   |   |   |   |   |          |          |          |          |   |   |   |
| CO3  | Have a working knowledge of a typical neural network simulation  |   |   |   |   |   |          |          |          |          |   |   |   |
| CO4  | Experience in programming NN applications from scratch.  |   |   |   |   |   |          |          |          |          |   |   |   |
| CO5  | Have knowledge of sufficient theoretical background to be able to reason about the behaviour of neural networks. |   |   |   |   |   |          |          |          |          |   |   |   |
| CO6  | Have knowledge of sufficient theoretical background to be able to reason about the behaviour of neural networks. |   |   |   |   |   |          |          |          |          |   |   |   |
| 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 |   |          |          |          |          |   |   |   |
|  | CO2  |   | H |   | H |   |          |          |          |          |   |   |   |
|  | CO3  | M | H |   | H |   |          |          |          |          |   |   |   |
|  | CO4  |   | H | H | H |   |          |          |          |          |   |   |   |
|  | CO5  | L | H |   | H |   | M        |          |          |          |   |   |   |
|  | CO6  |   |   |   |   |   |          |          |          |          |   |   |   |

|   |          |  |                     |                    |                        |                    |                         |                    |   |
|---|----------|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences (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 BACK PROPAGATION

9

Introduction to Artificial Neural systems - Perception - Representation - Linear Separability - Learning - Training algorithm - The back propagation network - The generalized data rule - Practical considerations - BPN applications.

### UNIT-II STATISTICAL METHODS

9

Hopfield nets - Cauchy training - Simulated annealing-The Boltzmann machine. Associative memory - Bidirectional associative memory -Applications.

### UNIT-III COUNTER PROPAGATION NETWORK & SELF ORGANISATION MAPS

9

CRN building blocks - CPN data processing. SQM data processing - Applications

### UNIT-IV ART AND SPATIO TEMPORAL PATTERN CLASSIFICATION

9

ART network description - ART1 -ART2-Application. The formal avalanche -Architecture of station temporal networks - The sequential competitive avalanche field - Applications of STNs.

### UNIT-V NEO-CONGNITRON

9

Cognitron - Structure & training - The neocognitron architecture - Data processing - Performance - Addition of lateral inhibition and feedback to the neocognitron. Optical neural networks - Holographic correlators.

### TEXT BOOKS:

1. James Freeman A and David Skapura M. "Neural Networks – Algorithms, Applications & Programming Techniques", Pearson Education, 2005.
2. Yegnanarayana B., "Artificial Neural Networks", Prentice Hall of India Private Ltd, 2003

### REFERENCE BOOKS:

1. Neural Network Design, Martin T Hagan, 2<sup>nd</sup> edition, 2014.
2. Principle of neural science, Eric R.Kandel, 5<sup>th</sup> edition, 2012.
3. <http://hagan.okstate.edu/NNDesign.pdf>

### NON MAJOR ELECTIVE-III

|   |  |  |                     |                    |                        |                    |                         |                    |   |          |          |   |   |
|---|--|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---|----------|----------|---|---|
| <b>BBM405</b>   | <b>BIOSENSORS AND TRANSDUCERS</b>  |  |                     |                    |                        |                    |                         | <b>L</b>           | <b>T</b>                                    | <b>P</b> | <b>C</b> |   |   |
|   | Total Contact Hours – 45   |  |                     |                    |                        |                    |                         | 3                  | 0   | 0        | 3        |   |   |
|   | Prerequisite –Biology for Engineers.   |  |                     |                    |                        |                    |                         |                    |   |          |          |   |   |
|   | Course Designed by – Dept. of Bio Medical Engineering.   |  |                     |                    |                        |                    |                         |                    |   |          |          |   |   |
| <b>OBJECTIVES</b>   |  |  |                     |                    |                        |                    |                         |                    |   |          |          |   |   |
| <ul style="list-style-type: none"> <li>Understand the purpose of measurement, the methods of measurements, errors associated with measurements.</li> <li>Know the principle of transduction, classifications and the characteristics of different transducers and study its biomedical applications.</li> </ul> |  |  |                     |                    |                        |                    |                         |                    |   |          |          |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |  |  |                     |                    |                        |                    |                         |                    |   |          |          |   |   |
| CO1   | Describe the purpose and methods of measurements.  |  |                     |                    |                        |                    |                         |                    |   |          |          |   |   |
| CO2   | Explain different display and recording devices for various applications.  |  |                     |                    |                        |                    |                         |                    |   |          |          |   |   |
| CO3   | Know the principle of transduction, classifications and the characteristics of different transducers and study its biomedical applications |  |                     |                    |                        |                    |                         |                    |   |          |          |   |   |
| CO4   | Remember and understand the concepts, types, working and practical applications of important biosensors.                                   |  |                     |                    |                        |                    |                         |                    |   |          |          |   |   |
| CO5   | Know some of the commonly used biomedical transducers.   |  |                     |                    |                        |                    |                         |                    |   |          |          |   |   |
| CO6   | Know the different display and recording 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  | M  | H                   | M                  | H                      | H                  | M                       | H                  |   |          | L        | M |   |
|   | CO2  | M  | H                   | M                  | H                      | H                  | M                       | H                  |   |          | L        | M |   |
|   | CO3  | M  | H                   | M                  | H                      | H                  | M                       | H                  |   |          | L        | M |   |
|   | CO4  | M  | H                   | M                  | H                      | H                  | M                       | H                  |   |          | L        | M |   |
|   | CO5  | M  | H                   | M                  | H                      | H                  | M                       | H                  |   |          | L        | M |   |
|   | CO6  | M  | H                   | M                  | H                      | H                  | M                       | H                  |   |          | L        | M |   |
| 3   | Category   | Humanities & Social Studies (HS)                               | Basic Sciences (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 SCIENCE OF MEASUREMENT

9

Units and Standards - calibration methods - statics calibration - classification of errors, error analysis - statistical methods - odds and uncertainty.

**UNIT II CHARACTERISTICS OF TRANSDUCERS 9**

Static characteristics - accuracy, precision, sensitivity, linearity etc - mathematical model of transducers - zero first - order and second - order transducers - response to impulse step, ramp and sinusoidal inputs.

**UNIT III VARIABLE RESISTANCE TRANSDUCERS 9**

Principle of operation, construction details, characteristics and applications of resistance potentiometers, strain gauges, resistance thermometers, thermistors, hot-wire anemometer, piezoresistive sensors and humidity sensors.

**UNIT IV BIOSENSORS - PHYSIOLOGICAL RECEPTORS - J RECEPTORS 9**

Chemoreceptors, Baroreceptors, Touch receptors, Biosensors - Working Principle and Types, Applications.

**UNIT V OTHER TRANSDUCERS 9**

Piezoelectric transducers, magnetostrictive transducer, IC sensor digital transducers - smart sensor - fibre optic transducers.

**TEXT BOOKS:**

1. Doebelin. E. O, Measurement Systems, McGraw Hill Book Co. 1998

**REFERENCE BOOKS:**

1. Renganathan S, Transducer Engineering, Allied Publishers, Chennai, 2000.

2. [https://www1.ethz.ch/lbb/Education/Biosensors/Lecture\\_1\\_overview.pdf](https://www1.ethz.ch/lbb/Education/Biosensors/Lecture_1_overview.pdf)

| <b>BEI704</b>   | <b>VIRTUAL INSTRUMENTATION</b>   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|---|--|----------|----------|----------|----------|
|   | Total Contact Hours – 45   | 3        | 0        | 0        | 3        |
|   | Prerequisite – Nil   |          |          |          |          |
|   | Course Designed by – Dept of Electronics & Instrumentation Engineering |          |          |          |          |
| <b>OBJECTIVES</b>   |  |          |          |          |          |
| <ul style="list-style-type: none"> <li>To provide knowledge on design of process control by using virtual instrumentation techniques</li> <li>To provide knowledge in process analysis by VI tools.</li> <li>To give basic knowledge in describing function analysis.</li> <li>Get adequate knowledge VI tool sets</li> </ul> |  |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>  |  |          |          |          |          |
| CO1   | To describe about virtual instrumentation.                             |          |          |          |          |
| CO2   | Get adequate knowledge VI tool sets                                    |          |          |          |          |
| CO3   | To describe data acquisition   |          |          |          |          |
| CO4   | To get introduced to VI programming techniques                         |          |          |          |          |
| CO5   | To understand VI programming techniques                                |          |          |          |          |
| CO6   | To get an adequate knowledge application of virtual instrumentation    |          |          |          |          |

| 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                      | M                  |                         | M                  |   |   | L | L | M |
|   | CO2      | H  | M                   | M                   | H                      | H                  |                         | M                  |   |   | L | L | M |
|   | CO3      | H  | M                   |                     | H                      | H                  |                         | M                  |   |   | L | L | M |
|   | CO4      | H  | M                   |                     | H                      | H                  |                         | M                  |   |   | L | L | M |
|   | CO5      | H  | M                   | M                   | H                      | H                  |                         | M                  |   |   | L | L | M |
|   | CO6      | H  |                     |                     | H                      | H                  |                         | M                  |   |   | L | L | M |
| 3   | Category | Humanities & Social Studies (HS)   | Basic Sciences (BS) | Basic Sciences (ES) | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective (OE) | Project/Term Paper/Seminar/ Internship (PR) |   |   |   |   |
|   |          |  |                     |                     | √                      |                    |                         |                    |   |   |   |   |   |
| 4   | Approval | 37 <sup>th</sup> – 40 <sup>th</sup> Meetings of Academic Council, May 2015 – Sept 2016 |                     |                     |                        |                    |                         |                    |   |   |   |   |   |

### UNIT I INTRODUCTION

9

Virtual Instrumentation: Historical perspective - advantages - block diagram and Architecture of a virtual instrument - Conventional Instruments versus Traditional Instruments - data-flow techniques, graphical programming in data flow, comparison with conventional programming.

### UNIT II VI PROGRAMMING TECHNIQUES

9

VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence Structures, formula nodes, local and global variables, State machine, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

### UNIT III DATA ACQUISITION

9

Introduction to data acquisition on PC, Sampling fundamentals, Input/output techniques and buses. Latest ADCs, DACs, Digital I/O, counters and timers, DMA, Software and Hardware installation, Calibration, Resolution, Data acquisition interface requirements – Issues involved in selection of Data acquisition cards – Data acquisition cards with serial Communication - VI Chassis requirements. SCSI, PCI, PXI system controllers, Ethernet Control of PXI. Networking basics for office & Industrial applications, VISA and IVI.

### UNIT IV VI TOOLSETS

9

Use of Analysis tools, Fourier transforms, power spectrum, correlation methods, Windowing and filtering. Application of VI in process control designing of equipments like oscilloscope, Digital multimeter, Design of digital Voltmeters with transducer input Virtual Laboratory, Web based Laboratory

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

Distributed I/O modules- Application of Virtual Instrumentation: Instrument Control, Development of process database management system, Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, Motion control. Development of Virtual Instrument using GUI, Real-time systems, Embedded Controller, OPC, HMI / SCADA software, Active X programming.

**TEXT BOOKS:**

1. Gary Johnson, Lab VIEW Graphical Programming, Second edition, McGraw Hill, New York, 1997.
2. Lisa K. wells & Jeffrey Travis, Lab VIEW for everyone, Prentice Hall, New Jersey, 1997.

**REFERENCE BOOKS:**

1. Kevin James, PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, Newness, 2000.

|   |  |  |   |   |   |   |   |   |   |   |          |          |          |          |
|---|--|--|---|---|---|---|---|---|---|---|----------|----------|----------|----------|
| <b>BET603</b>   | <b>TELECOMMUNICATION SWITCHING NETWORKS</b>                                  |  |   |   |   |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|   | Total Contact Hours – 45   |  |   |   |   |   |   |   |   |   | 3        | 0        | 0        | 3        |
|   | Prerequisite –Computer Networks  |  |   |   |   |   |   |   |   |   |          |          |          |          |
|   | Course Designed by – Dept. of Electronics and Telecommunication Engineering. |  |   |   |   |   |   |   |   |   |          |          |          |          |
| <b>OBJECTIVES</b>   |  |  |   |   |   |   |   |   |   |   |          |          |          |          |
| <ul style="list-style-type: none"> <li>To learn about the concepts of switching system and networks in detail.</li> </ul>   |  |  |   |   |   |   |   |   |   |   |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>  |  |  |   |   |   |   |   |   |   |   |          |          |          |          |
|   | CO1  | To learn about the various switching systems                       |   |   |   |   |   |   |   |   |          |          |          |          |
|   | CO2  | To learn in detail about time division switching.                  |   |   |   |   |   |   |   |   |          |          |          |          |
|   | CO3  | To know about traffic management.                                  |   |   |   |   |   |   |   |   |          |          |          |          |
|   | CO4  | To understand about various signaling in telecommunication systems |   |   |   |   |   |   |   |   |          |          |          |          |
|   | CO5  | To analyse various telecommunication networks                      |   |   |   |   |   |   |   |   |          |          |          |          |
|   | CO6  | To estimate the performance of telecommunication networks.         |   |   |   |   |   |   |   |   |          |          |          |          |
| 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 |   |   |   | M |   |   |          |          |          |          |
|   | CO2  | H  | H | L | L |   |   |   |   |   |          |          |          |          |
|   | CO3  | M  | M | H | M | M |   |   |   |   | M        |          |          |          |
|   | CO4  | M  |   | L |   |   |   |   |   | M |          | M        | M        |          |
|   | CO5  | H  | M |   |   |   |   | M |   | M |          |          |          |          |
|   | CO6  | M  |   | M |   | M | M |   | H | M | M        |          | M        |          |

|   |          |  |                     |                    |                        |                    |                         |                    |  |
|---|----------|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|--|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences (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 SWITCHING SYSTEMS 9**

Introduction-Message switching-Circuit switching-Manual switching-Functions of switching system- Strowger step by step system-Register translator-Senders-Distribution frames-Cross bar systems-General trunking-Electronic switching-Reed electronic systems-Digital switching systems.

### **UNIT II TIME DIVISION SWITCHING 9**

Introduction-Space and time switching-Time division switching networks-grades of services-Time division switching networks-non blocking networks-synchronization.

### **UNIT III TELECOMMUNICATION TRAFFIC 9**

Introduction-Unit of traffic-Congestion-Traffic measurement-A mathematical model-Local calls systems-Queuing systems.

### **UNIT IV TELECOMMUNICATION SIGNALLING 9**

Introduction-Customer line signaling- Audio frequency junction and trunk circuits-FDM carrier systems-PCM signaling- Inter register signaling- Common channel signaling principles-CCITT signaling, CCITT signaling, Digital customer line signaling.

### **UNIT V TELECOMMUNICATION NETWORKS 9**

Introduction-Analog networks-Integrated digital networks-Integrated service digital networks-Cellular radio networks-Intelligent networks-Private networks-numbering-charging-Routing-Network management.

#### **TEXT BOOKS:**

1. J.E FLOOD, "Telecommunication Switching, Traffic and Networks" Pearson Education.

#### **REFERENCE BOOKS:**

1. T.V.Swaminathan, "Telecommunication Switching System & Networks", PHI.
2. <http://www.newagepublishers.com/samplechapter/000969.pdf>

### OPEN ELECTIVE-I

| BBA008   | TOTAL QUALITY MANAGEMENT  |  |                             |               |                        | L                  | T                       | P             | C   |   |   |   |   |
|--|---|--|-----------------------------|---------------|------------------------|--------------------|-------------------------|---------------|---|---|---|---|---|
|  | Total Contact Hours – 45  |  |                             |               |                        | 3                  | 0                       | 0             | 3   |   |   |   |   |
|  | Prerequisite – Quality Engineering & Professional Courses   |  |                             |               |                        |                    |                         |               |   |   |   |   |   |
|  | Course Designed by – Dept of Mechanical Engineering   |  |                             |               |                        |                    |                         |               |   |   |   |   |   |
| <b>OBJECTIVES</b>  |   |  |                             |               |                        |                    |                         |               |   |   |   |   |   |
| <ul style="list-style-type: none"> <li>• To introduce to the student about the basic terms related to quality and concepts of quality management</li> <li>• To familiarize the student about the basic principles of total quality management</li> <li>• To acquaint the student with the basic statistical tools used in process control</li> <li>• To introduce to the student about the various tools used in implementing and checking total quality management</li> </ul> |   |  |                             |               |                        |                    |                         |               |   |   |   |   |   |
| <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  |  |                             |               |                        |                    |                         |               |   |   |   |   |   |
| CO6  | To familiarize the student about the different quality systems used in auditing the quality of a company/industry/organization  |  |                             |               |                        |                    |                         |               |   |   |   |   |   |
| 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                                    | Basic Sciences & Maths (BS) | Engg Sciences | Professional Core (PC) | Core Elective (CE) | Non-Major Elective (NE) | Open Elective | 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, PDSA 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, and 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”, (5th 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.

|  |                                     |          |          |          |          |
|--|-------------------------------------|----------|----------|----------|----------|
|  | <b>PRINCIPLES OF MANAGEMENT AND</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|--|-------------------------------------|----------|----------|----------|----------|

|   |   |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |   |   |
|---|---|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---|---|---|---|---|---|---|
| <b>BBA001</b>   | <b>ORGANIZATIONAL BEHAVIOUR</b>                             |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |   |   |
|   | Total Contact Hours – 45                                    |  |                     |                    |                        |                    |                         |                    |   |   |   | 3 | 0 | 0 | 3 |
|   | Prerequisite – Management & Professional Courses            |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |   |   |
|   | Course Designed by – Department of Management Studies       |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |   |   |
| <b>OBJECTIVES</b>   |   |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |   |   |
| <ul style="list-style-type: none"> <li>Familiarize the students with the fundamental concepts of Management and to highlight the approaches in organization behavior</li> </ul> |   |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |   |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |   |   |
| CO1   | Understanding the concepts of Management                    |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |   |   |
| CO2   | Knowledge on Management Functions                           |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |   |   |
| CO3   | Understanding the Organization Theory & Approach.           |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |   |   |
| CO4   | Knowledge on the Concepts of Motivation                     |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |   |   |
| CO5   | Clear insight on the factors contributing to discipline     |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |   |   |
| CO6   | In-depth Understanding about the concepts of Group Behavior |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |   |   |
| 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 |   |   |   |   |   |
|   | CO3   | M  |                     |                    |                        |                    |                         |                    | M   |   | H |   |   |   |   |
|   | CO4   |  |                     | M                  | H                      |                    |                         |                    |   |   |   | H |   |   |   |
|   | CO5   |  |                     |                    |                        |                    |                         | M                  |   |   |   |   |   |   |   |
|   | CO6   |  |                     |                    | H                      |                    |                         |                    |   |   |   |   |   | L |   |
| 3   | Category  | Humanities & Sciences (HS)                                     | Basic Sciences (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 NATURE OF MANAGEMENT

9

Definition – theory and practice – effective management – Management : Science of Art – Management in India. Development of Management thoughts – Taylor’s – Henry Fayol – Hawthorne experiment – Barnard & Social system – Herbert Simon – Peter Drucker – Various approaches – Management thoughts.

### UNIT- II MANAGEMENT PROCESS

9

Co-ordination – Functions of management – Managers and environment – External and internal Business Ethics – Planning – Fundamentals – Definitions & Features – Steps in planning – types of planning – Objectives – Concepts and features – Hierarchy of objectives – role – Process of MBO – Policy & Strategy – Decision making process – Individual Vs Group Decisions.

**UNIT- III ORGANIZATION STRUCTURE****9**

Organizing – Theory & Approach – Authority & Responsibility – Delegation – Centralization & Decentralization – Line & Staff Relationship – Staffing – Fundamentals – System approach – Manpower Planning – Recruitment & Selection – Training and development – Performance appraisal – Direction – Fundamentals Motivation – Theories of Motivation-Maslow’s Hersberg’s MaClelland’s theory X,Y & Z leadership – Theories and Styles – Communication – Type – Controlling – System and Process.

**UNIT- IV ORGANIZATIONAL BEHAVIOUR****9**

Definition – Organization – Managerial Role and Functions – Organizational Approaches, Individual behaviour – Causes – Environmental effect – Behaviour and performance, perception – Organizational implications, Personality – Contributing factors – Dimension, Motivation – Need Theories – Process Theories – Job satisfaction, Learning and Behaviour – Learning Curves, Work Design and Approaches.

**UNIT -V GROUP BEHAVIOUR****9**

Groups – Contributing factors – Group Norms, types – Causes – Intergroup relations – Conflict and Resolution – Change Process – Resistance to change.

**TEXT BOOKS:**

1. Herald Knootz and Heinz weihrich, ‘Essentials of Management’, McGraw Hill Publishing Company, Singapore International Edition, 2004.
2. Ties AF, Stoner and R. Edward Freeman, “Management” Prentice Hall of India Pvt. Ltd., New Delhi -110011, 1995.

**REFERENCE BOOKS :**

1. Joseph I. Massie ‘Essentials of Management’, Prentice Hall of India Pvt. Ltd, New Delhi - 110011, 2004.
2. L.M. Prasad “Principles and Practice of Management”, Sultan Chand & Sons.2001
3. Uma Sekaran, “Organizational Behaviour”, Tata McGraw Hill, 2007.

| <b>.BBA004</b>  | <b>ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|---|---|----------|----------|----------|----------|
|   | Total Contact Hours - 45                              | 3        | 0        | 0        | 3        |
| Prerequisite –Basic Economics& Professional Courses   |   |          |          |          |          |
| Course Designed by – Dept. of Electronics & Communication Engineering   |   |          |          |          |          |
| <b>OBJECTIVES</b>   |   |          |          |          |          |
| <ul style="list-style-type: none"> <li>• Acquire knowledge of economics to facilitate the process of economic decision making</li> <li>• Acquire knowledge on basic financial management aspects</li> <li>• Develop the skills to analyze financial statements</li> </ul> |   |          |          |          |          |

| <b>COURSE OUTCOMES (COs)</b>  |  |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |
|---|--|--|---------------------|--------------------|------------------------|--------------------|-------------------------|--------------------|---|---|---|---|---|
| CO1   | Evaluate the economic theories, cost concepts and pricing policies   |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |
| CO2   | Understand the market structures and integration concepts  |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |
| CO3   | Understand the measures of national income, the functions of banks and concepts of globalization   |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |
| CO4   | Apply the concepts of financial management for project appraisal   |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |
| CO5   | Understand accounting systems and analyze financial statements using ratio analysis  |  |                     |                    |                        |                    |                         |                    |   |   |   |   |   |
| CO6   | Understand the impact of inflation, taxation, depreciation. Financial planning, economic basis for replacement, project scheduling, and legal and regulatory issues are introduced and applied to economic investment and project-management 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  |                     |                    |                        |                    | M                       |                    |   |   | M |   |   |
|   | CO2  | M  | L                   | H                  |                        |                    |                         |                    | L   |   |   |   |   |
|   | CO3  | H  |                     |                    | H                      |                    |                         |                    |   | H |   |   | H |
|   | CO4  | M  |                     |                    |                        | H                  |                         | M                  |   |   |   | M |   |
|   | CO5  |  | L                   |                    |                        |                    |                         |                    |   |   |   |   |   |
|   | CO6  |  |                     |                    |                        |                    | H                       |                    |   |   |   |   |   |
| 3   | Category   | Humanities & Social Studies (HS)                               | Basic Sciences (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 ECONOMICS, COST AND PRICING CONCEPTS<sup>9</sup>

Economic theories – Demand analysis – Determinants of demand – Demand forecasting – Supply – Actual cost and opportunity cost – Incremental cost and sunk cost – Fixed and variable cost – Marginal costing – Total cost – Elements of cost – Cost curves – Breakeven point and breakeven chart – Limitations of break even chart – Interpretation of break even chart – Contribution – P/V-ratio, profit-volume ratio or relationship – Price fixation – Pricing policies – Pricing methods.

### UNIT II CONCEPTS ON FIRMS AND MANUFACTURING PRACTICES 9

Firm – Industry – Market – Market structure – Diversification – Vertical integration – Merger – Horizontal integration

**UNIT III NATIONAL INCOME, MONEY AND BANKING, ECONOMIC ENVIRONMENT 9**

National income concepts – GNP – NNP – Methods of measuring national income – Inflation – Deflation – Kinds of money – Value of money – Functions of bank – Types of bank – Economic liberalization – Privatization – Globalization

**UNITIV CONCEPTS OF FINANCIAL MANAGEMENT 9**

Financial management – Scope – Objectives – Time value of money – Methods of appraising project profitability – Sources of finance – Working capital and management of working capital

**UNITV ACCOUNTING SYSTEM, STATEMENT AND FINANCIAL ANALYSIS9**

Accounting system – Systems of book-keeping – Journal – Ledger – Trail balance – Financial statements – Ratio analysis – Types of ratios – Significance – Limitations

**TEXT BOOKS:**

1. Prasanna Chandra, “Financial Management” (Theory & Practice) TMH
2. Weston & Brigham, “Essentials of Managerial Finance”

**REFERENCE BOOKS:**

- 1.Pandey, I. M., “Financial Management”
- 2.James C. Van Horne.”Fundamentals of Financial Management”-

| <b>BBA009</b>  | <b>INTELLECTUAL PROPERTY RIGHTS</b>  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|--|--|----------|----------|----------|----------|
|  | Total Contact Hours - 45   | 3        | 0        | 0        | 3        |
| Prerequisite – Value Education and Professional Ethics & Professional Courses  |  |          |          |          |          |
| Course Designed by – Dept of Management Studies  |  |          |          |          |          |
| <b>OBJECTIVES</b>  |  |          |          |          |          |
| Strong intellectual property rights (IPR) protection is crucial to fostering trade, and achieving the goals and benefits of global integration. Countries with high standards of IPR protection tend to attract more investment, stimulate more innovation, thereby developing more rapidly. Countries with inadequate protection are often vulnerable to infringements of intellectual property rights that hinder trade flow and economic development. Hence, the objective is to introduce IPR to the UG Engineering and Technology students. |  |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>   |  |          |          |          |          |
| CO1  | Understand the principles, function and basic legal rules of IP Law.   |          |          |          |          |
| CO2  | Recognize the relevant criteria for generating and protecting intellectual works.                              |          |          |          |          |
| CO3  | Recognize the intellectual property likely to be produced in the academic and professional environment.        |          |          |          |          |
| CO4  | Demonstrate appreciation and critical awareness of pertinent IP issues in the academic and professional lives. |          |          |          |          |

|   |   |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |   |
|---|---|--|---|---------------------|---|--------------------|---|------------------------|---|--------------------|---|-------------------------|---|--------------------|--|---|--|---|
| CO5   | Understand the relevance and impact of IP Law on academic/scientific works/studies. |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |   |
| CO6   | Understand the different forms of infringement of intellectual property rights.     |  |   |                     |   |                    |   |                        |   |                    |   |                         |   |                    |  |   |  |   |
| 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                  |   |                         |   |                    |  |   |  |   |
|   | CO3   | M  |   |                     |   |                    |   |                        | M |                    | H |                         |   |                    |  |   |  |   |
|   | CO4   |  |   | M                   | H |                    |   |                        |   |                    |   | H                       |   |                    |  |   |  |   |
|   | CO5   |  |   |                     |   |                    |   | M                      |   |                    |   |                         |   |                    |  |   |  |   |
|   | CO6   | H  |   |                     | H |                    |   |                        |   |                    | M |                         |   | L                  |  |   |  |   |
| 3   | Category  | Humanities & Social Studies (HS)                               |   | Basic Sciences (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 PROPERTIES AND TYPES

9

Introduction – Invention and Creativity – Intellectual Property (IP) – Importance – Protection of IPR – Basic types of property (i). Movable Property ii. Immovable Property and iii. Intellectual Property.

### UNIT II PATENTS AND RIGHTS

9

IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and International levels – Application Procedures..

### UNIT III INTERNATIONAL TRADE

9

International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT).

### UNIT IV WTO

9

Indian Position Vs WTO and Strategies – Indian IPR legislations – commitments to WTO-Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy – Present against unfair competition.

### UNIT V CASE STUDIES

9

Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition.

### TEXT BOOKS:

1. Subbaram N.R. “Handbook of Indian Patent Law and Practice “, S. Viswanathan Printers and Publishers Pvt. Ltd., 1998.

**REFERENCES:**

1. Eli Whitney, United States Patent Number: 72X, Cotton Gin, March 14, 1794.
2. Intellectual Property Today: Volume 8, No. 5, May 2001, [www.iptoday.com].
3. Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000.
4. www.ipmatters.net/features/000707\_gibbs.html.
5. [http://www.metastudio.org/Science%20and%20Ethics/file/readDoc/535a76367d9d331598f49e2d/34\\_Hb\\_on\\_IPR.pdf](http://www.metastudio.org/Science%20and%20Ethics/file/readDoc/535a76367d9d331598f49e2d/34_Hb_on_IPR.pdf)

**OPEN ELECTIVE-II**

|   |  |   |   |   |   |   |   |          |          |          |          |   |   |
|---|--|---|---|---|---|---|---|----------|----------|----------|----------|---|---|
| <b>BEI701</b>   | <b>LOGIC AND DISTRIBUTED CONTROL SYSTEM</b>                            |   |   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |
|   | Total Contact Hours - 45   |   |   |   |   |   |   | 3        | 1        | 0        | 4        |   |   |
|   | Prerequisite – Microcontroller & Control System                        |   |   |   |   |   |   |          |          |          |          |   |   |
|   | Course Designed by – Dept of Electronics & Instrumentation Engineering |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>OBJECTIVES</b>   |  |   |   |   |   |   |   |          |          |          |          |   |   |
| <ul style="list-style-type: none"> <li>• To give an introductory knowledge on Programmable Logic Controller (PLC) and their Programming languages</li> <li>• To give adequate knowledge about applications of PLC</li> <li>• To give basic knowledge about Computer Controlled Systems</li> <li>• To give basic knowledge on the architecture and local control unit of Distributed Control System(DCS)</li> <li>• To give adequate information with respect to interfaces used in DCS</li> </ul> |  |   |   |   |   |   |   |          |          |          |          |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |  |   |   |   |   |   |   |          |          |          |          |   |   |
| CO1   | To describe the networks used in PLC and DCS.                          |   |   |   |   |   |   |          |          |          |          |   |   |
| CO2   | Get adequate knowledge about operator interface used in DCS.           |   |   |   |   |   |   |          |          |          |          |   |   |
| CO3   | To describe the HART in DCS  |   |   |   |   |   |   |          |          |          |          |   |   |
| CO4   | To describe the field bus in DCS                                       |   |   |   |   |   |   |          |          |          |          |   |   |
| CO5   | To understand the systems used in distributed control system.          |   |   |   |   |   |   |          |          |          |          |   |   |
| CO6   | To get an adequate knowledge application of PLC                        |   |   |   |   |   |   |          |          |          |          |   |   |
| 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 | M |   | M        |          |          | L        | L | M |
|   | CO2  | H | M | M | H | H |   | M        |          |          | L        | L | M |
|   | CO3  | H | M |   | H | H |   | M        |          |          | L        | L | M |
|   | CO4  | H | M |   | H | H |   | M        |          |          | L        | L | M |
|   | CO5  | H | M | M | H | H |   | M        |          |          | L        | L | M |

|   | CO6      | H  |                             |                     | H                      | H                  |                         | M                  |   |  | L | L | M |
|---|----------|--|-----------------------------|---------------------|------------------------|--------------------|-------------------------|--------------------|---|--|---|---|---|
| 3 | Category | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Basic 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 PROGRAMMABLE LOGIC CONTROLLER**

**9**

Evolution of PLCs – Components of PLC – Architecture of PLC – Discrete and analog I/O modules – Programming languages -Ladder diagram – Function block diagram (FBD) - Programming timers and counters

### **UNITII APPLICATIONS OF PLC**

**9**

Instructions in PLC – Program control instructions, math instructions, data manipulation Instructions, sequencer and shift register instructions – Case studies in PLC

### **UNIT III COMPUTER CONTROLLED SYSTEMS**

**9**

Basic building blocks of computer controlled systems – Data acquisition system – Supervisory control – Direct digital control- SCADA: - Hardware and software, Remote terminal units, Master Station and Communication architectures.

### **UNIT IV DISTRIBUTED CONTROL SYSTEM**

**9**

DCS – Various Architectures – Comparison – Local control unit – Process interfacing issues – Communication facilities

### **UNIT V INTERFACES IN DCS**

**9**

Operator interfaces - Low level and high level operator interfaces – Displays - Engineering interfaces – Low level and high level engineering interfaces – Factors to be considered in selecting DCS – Case studies in DCS

#### **TEXT BOOKS:**

1. F.D. Petruzella, Programmable Logic Controllers, Tata Mc-Graw Hill, Third Edition, 2010
2. Michael P. Lukas, Distributed Control Systems: Their Evaluation and Design, Van Nostrand Reinhold Co., 1986
3. D. Popovic and V.P.Bhatkar, ' Distributed computer control for industrial Automation'Marcel Dekker, Inc., Newyork, 1990.

#### **REFERENCE BOOKS:**

1. T.A. Hughes, Programmable Controllers, Fourth edition, ISA press, 2005
2. Krishna Kant, Computer Based Industrial Control, Second edition, Prentice Hall of India,New Delhi, 2010.

3. John W. Webb and Ronald A. Reis, 'Programmable Logic Controllers, Fifth edition, Prentice Hall of India, New Delhi, 2010.
4. John R. Hackworth and Frederick D. Hackworth Jr, Programmable Logic Controllers, Pearson, New Delhi, 2004.
5. Clarke, G., Reynders, D. and Wright, E., "Practical Modern SCADA Protocols: DNP3,4, 60870.5 and Related Systems", Newnes, 1st Edition, 2004.
6. E.A. Parr, Programmable Controllers, An Engineer's Guide, Elsevier, 2013.

|   |  |   |   |   |   |          |          |          |          |   |   |   |   |
|---|--|---|---|---|---|----------|----------|----------|----------|---|---|---|---|
| <b>BET008</b>   | <b>WIRELESS NETWORKS</b>   |   |   |   |   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |   |   |   |   |
|   | Total Contact Hours - 45   |   |   |   |   | 3        | 0        | 0        | 3        |   |   |   |   |
|   | Prerequisite – Communication Engineering-II, Computer Networks   |   |   |   |   |          |          |          |          |   |   |   |   |
|   | Course Designed by – Dept. of Electronics & Tele Communication Engineering   |   |   |   |   |          |          |          |          |   |   |   |   |
| <b>OBJECTIVES</b>   |  |   |   |   |   |          |          |          |          |   |   |   |   |
| <ul style="list-style-type: none"> <li>• To study about Wireless networks, protocol stack and standards.</li> <li>• To study about fundamentals of 3G Services, its protocols and applications.</li> <li>• To study about evolution of 4G Networks, its architecture and applications.</li> </ul> |  |   |   |   |   |          |          |          |          |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |  |   |   |   |   |          |          |          |          |   |   |   |   |
| CO1   | Conversant with the latest 3G/4G and Wi-MAX networks and its architecture.   |   |   |   |   |          |          |          |          |   |   |   |   |
| CO2   | Design and implement wireless network environment for any application using latest wireless protocols and standards. |   |   |   |   |          |          |          |          |   |   |   |   |
| CO3   | Implement different type of applications for smart phones and mobile devices with latest network strategies          |   |   |   |   |          |          |          |          |   |   |   |   |
| CO4   | Compare and contrast multiple division techniques, mobile communication systems, and existing wireless networks.     |   |   |   |   |          |          |          |          |   |   |   |   |
| CO5   | Classify network protocols, ad hoc and sensor networks, wireless MANs, LANs and PANs;                                |   |   |   |   |          |          |          |          |   |   |   |   |
| CO6   | Apply wireless ID technologies, in particular RFID work.   |   |   |   |   |          |          |          |          |   |   |   |   |
| 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  | M | L | H |   |          |          |          | L        |   |   |   |   |
|   | CO3  | M |   |   | M |          |          |          |          | H |   |   | L |
|   | CO4  | L |   |   |   | H        |          | M        |          |   |   | M |   |
|   | CO5  |   | M |   |   |          |          |          |          |   |   |   |   |
|   | 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/ Seminar/ Internship (PR) |
|   |          |  |                             |                    |                        |                    | √                       |                    |                                   |
| 4 | Approval | 37th - 40th Meetings of Academic Council, May 2015 - Sept 2016 |                             |                    |                        |                    |                         |                    |                                   |

### **UNIT- I WIRELESS LAN**

**9**

Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, Radio Layer, Baseband layer Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX

### **UNIT- II MOBILE NETWORK LAYER**

**9**

Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6- Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: Routing, Destination Sequence distance vector, Dynamic source routing

### **UNIT –III MOBILE TRANSPORT LAYER**

**9**

TCP enhancements for wireless protocols - Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of mobility - Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, Transaction oriented TCP - TCP over 3G wireless networks.

### **UNIT- IV WIRELESS WIDE AREA NETWORK**

**9**

Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3G-MSC, 3G-SGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)- LTE network architecture and protocol.

### **UNIT- V 4G NETWORKS**

**9**

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, OFDM-MIMO systems, Adaptive Modulation and coding with time slot scheduler, Cognitive Radio.

### **TEXT BOOKS:**

- 1.Jochen Schiller, “Mobile Communications”, Second Edition, Pearson Education 2012.(Unit I,II,III)
2. Vijay Garg, “Wireless Communications and Networking”, First Edition, Elsevier 2007.(Unit IV,V)

## REFERENCE BOOKS:

- 1.Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband", Second Edition, Academic Press, 2008.
- 2.Anurag Kumar, D.Manjunath, Joy kuri, "Wireless Networking", First Edition, Elsevier 2011.
- 3.Simon Haykin , Michael Moher, David Koilpillai, "Modern Wireless Communications", FirstEdition, Pearson Education 2013

|   |  |  |                             |                     |                        |                    |                         |                    |  |   |   |   |   |
|---|--|--|-----------------------------|---------------------|------------------------|--------------------|-------------------------|--------------------|--|---|---|---|---|
| <b>BEI012</b>   | <b>ANALOG INTEGRATED CIRCUIT DESIGN</b>  |  |                             |                     |                        | <b>L</b>           | <b>T</b>                | <b>P</b>           | <b>C</b>                                     |   |   |   |   |
|   | Total Contact Hours – 45   |  |                             |                     |                        | 3                  | 0                       | 0                  | 3  |   |   |   |   |
|   | Prerequisite – Linear Integrated Circuits                                      |  |                             |                     |                        |                    |                         |                    |  |   |   |   |   |
|   | Course Designed by – Dept of Electronics & Instrumentation Engineering         |  |                             |                     |                        |                    |                         |                    |  |   |   |   |   |
| <b>OBJECTIVES</b>   |  |  |                             |                     |                        |                    |                         |                    |  |   |   |   |   |
| To have an adequate knowledge in the measurement techniques for power and energy, power and introduce the meters used to measure current & voltage. |  |  |                             |                     |                        |                    |                         |                    |  |   |   |   |   |
| <b>COURSE OUTCOMES (COs)</b>  |  |  |                             |                     |                        |                    |                         |                    |  |   |   |   |   |
| CO1   | To describe about single stage amplifier.                                      |  |                             |                     |                        |                    |                         |                    |  |   |   |   |   |
| CO2   | To study about energy meters are included                                      |  |                             |                     |                        |                    |                         |                    |  |   |   |   |   |
| CO3   | To provide elaborate discussion about potentiometer & instrument transformers. |  |                             |                     |                        |                    |                         |                    |  |   |   |   |   |
| CO4   | To provide detailed study of resistance measuring methods.                     |  |                             |                     |                        |                    |                         |                    |  |   |   |   |   |
| CO5   | To provide detailed study of inductance and capacitance measurement.           |  |                             |                     |                        |                    |                         |                    |  |   |   |   |   |
| CO6   | To study about circuit realization of the various building blocks.             |  |                             |                     |                        |                    |                         |                    |  |   |   |   |   |
| 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                      | M                  |                         | M                  |  |   | L | L | M |
|   | CO2  | H  | M                           | M                   | H                      | H                  |                         | M                  |  |   | L | L | M |
|   | CO3  | H  | M                           |                     | H                      | H                  |                         | M                  |  |   | L | L | M |
|   | CO4  | H  | M                           |                     | H                      | H                  |                         | M                  |  |   | L | L | M |
|   | CO5  | H  | M                           | M                   | H                      | H                  |                         | M                  |  |   | L | L | M |
|   | CO6  | H  |                             |                     | H                      | H                  |                         | M                  |  |   | L | L | M |
| 3   | Category   | Humanities & Social Studies (HS)                               | Basic Sciences & Maths (BS) | Basic 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 SINGLE STAGE AMPLIFIERS 9

Basic MOS physics and equivalent circuits and models, CS, CG and Source Follower cascade and folded cascade configurations, differential amplifiers and current mirror configurations.

## **UNIT II HIGH FREQUENCY AND NOISE OF CHARACTERISTICS AMPLIFIERS 9**

Current mirrors, cascade stages for current mirrors, current mirror loads for differential pairs. Miller effect, association of poles with nodes, frequency response of CS, CG and source follower, cascade and differential pair stages Statistical characteristics of noise, noise in single stage amplifiers, noise in differential amplifiers.

## **UNIT III FEEDBACK AND OPERATIONAL AMPLIFIERS9**

Properties and types of negative feedback circuits, effect of loading in feedback networks, operational amplifier performance parameters, One-stage Op Amps, Two-stage Op Amps, Input range limitations, Gain boosting, slew rate, power supply rejection, noise in Op Amps.

## **UNIT IV STABILITY AND FREQUENCY COMPENSATION9**

General considerations, multiple systems, Phase Margin, Frequency Compensation, and Compensation of two stage Op Amps, Slewing in two stage Op Amps, and Other compensation techniques.

## **UNIT V BANDGAP REFERENCES**

**9**

Supply independent biasing, temperature independent references, PTAT current generation, Constant-Gm Biasing.

### **TEXT BOOKS:**

1. Behzad Razavi, "Design of Analog CMOS Integrated Circuits", Tata McGraw Hill, 2001
2. Willey M.C. Sansen, "Analog Design Essentials", Springer, 2006.

### **REFERENCE BOOKS:**

1. Grebene, "Bipolar and MOS Analog Integrated circuit design", John Wiley & sons, Inc., 2003.
2. Phillip E. Allen, Douglas R. Holberg, "CMOS Analog Circuit Design", Second edition, Oxford University Press, 2002
3. Recorded lecture available at <http://www.ee.iitm.ac.in/~ani/ee5390/index.html>
4. Jacob Baker "CMOS: Circuit Design, Layout, and Simulation, Third Edition", Wiley IEEE Press 2010 3<sup>rd</sup> Edition