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|---|---|---|---|---|---|---------------|---|---|---|---|---|--|
| Course Number and Name  |   |   |   |   |   |               |   |   |   |   |   |  |
| <b>BCE405 - TRANSPORTATION ENGINEERING</b>  |   |   |   |   |   |               |   |   |   |   |   |  |
| Credits and Contact Hours   |   |   |   |   |   |               |   |   |   |   |   |  |
| <b>3 &amp; 45</b>   |   |   |   |   |   |               |   |   |   |   |   |  |
| Course Coordinator's Name   |   |   |   |   |   |               |   |   |   |   |   |  |
| Mr.S.Vinothkumar  |   |   |   |   |   |               |   |   |   |   |   |  |
| Text Books and References   |   |   |   |   |   |               |   |   |   |   |   |  |
| <b>TEXT BOOKS:</b>  |   |   |   |   |   |               |   |   |   |   |   |  |
| 1. Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001.   |   |   |   |   |   |               |   |   |   |   |   |  |
| <b>REFERENCES:</b>  |   |   |   |   |   |               |   |   |   |   |   |  |
| 1. Indian Roads Congress (IRC) specifications: Guidelines and special publications on Traffic Planning and Management   |   |   |   |   |   |               |   |   |   |   |   |  |
| 2. Transportation Engineering – An Introduction, C.Jotin Khisty, B.Kent Lall, Prentice Hall of India Pvt Ltd, 2006  |   |   |   |   |   |               |   |   |   |   |   |  |
| 3. MORTH Guidelines for Highway Engineering.  |   |   |   |   |   |               |   |   |   |   |   |  |
| 4. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2000   |   |   |   |   |   |               |   |   |   |   |   |  |
| Course Description  |   |   |   |   |   |               |   |   |   |   |   |  |
| <ul style="list-style-type: none"> <li>To give an overview about the highway engineering with respect to, planning, design, construction and maintenance of highways as per IRC standards, specifications and methods.</li> </ul> |   |   |   |   |   |               |   |   |   |   |   |  |
| Prerequisites   |   |   |   |   |   | Co-requisites |   |   |   |   |   |  |
| Basic Mechanical Engineering  |   |   |   |   |   | NIL           |   |   |   |   |   |  |
| required, elective, or selected elective (as per Table 5-1)   |   |   |   |   |   |               |   |   |   |   |   |  |
| Course Outcomes (COs)   |   |   |   |   |   |               |   |   |   |   |   |  |
| CO1   | To prepare the plan for highways as per IRC standards                       |   |   |   |   |               |   |   |   |   |   |  |
| CO2   | To perform geometric design of urban and rural roads                        |   |   |   |   |               |   |   |   |   |   |  |
| CO3   | To design flexible and rigid pavements using IRC methods                    |   |   |   |   |               |   |   |   |   |   |  |
| CO4   | To suggests modern materials and methods of highway construction.           |   |   |   |   |               |   |   |   |   |   |  |
| CO5   | To evaluate, carry out maintenance and strengthening of existing pavements. |   |   |   |   |               |   |   |   |   |   |  |
| Student Outcomes (SOs) from Criterion 3 covered by this Course  |   |   |   |   |   |               |   |   |   |   |   |  |
| COs/SOs   | a   | b | c | d | e | f             | g | h | i | j | k |  |
| CO1   |   |   | H | H |   |               |   |   |   |   |   |  |
| CO2   |   |   | H | H |   |               |   |   |   |   |   |  |
| CO3   |   |   | H | H |   |               |   |   |   |   |   |  |
| CO4   |   |   | H | H |   |               |   |   |   |   |   |  |

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|  | CO5 |  |  | H | H |  |  |  |  |  |  |          |  |
| <b>List of Topics Covered</b>  |     |  |  |   |   |  |  |  |  |  |  |          |  |
| <b>UNIT I HIGHWAY PLANNING AND ALIGNMENT</b>   |     |  |  |   |   |  |  |  |  |  |  | <b>9</b> |  |
| Highway Development in India, Macadam's Method of Road Construction, Jayakar Committee Recommendations and Realizations, Twenty-year Road Development Plans, Concepts of On-going Highway Development Programmes at National Level, Institutions for Highway Development at National level - Indian Roads Congress, National Highway Authority of India, Ministry of Road Transport and Highways (MORTH) and Central Road Research Institute. Requirements of Ideal Alignment, Factors Controlling Highway Alignment Engineering Surveys for Alignment - Conventional Methods and Modern Methods (Remote Sensing, GIS and GPS techniques) Classification and Cross Section of Urban and Rural Roads (IRC), Highway Cross Sectional Elements – Right of Way, Carriage Way, Camber, Krebs, Shoulders and Footpaths [IRC Standards] |     |  |  |   |   |  |  |  |  |  |  |          |  |
| <b>UNIT II GEOMETRIC DESIGN OF HIGHWAYS</b>  |     |  |  |   |   |  |  |  |  |  |  | <b>9</b> |  |
| Design of Horizontal Alignments – Super elevation, Widening of Pavements on Horizontal Curves and Transition Curves [Derivation of Formulae and Problems] Design of Vertical Alignments – Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curves Sight Distances - Factors Affecting Sight Distances, PIEV Theory, Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight Distance at Intersections, Intermediate Sight Distance and Illumination Sight Distance [Derivations and Problems in SSD and OSD] Geometric Design of Hill Roads [IRC Standards Only]  |     |  |  |   |   |  |  |  |  |  |  |          |  |
| <b>UNIT III DESIGN OF RIGID AND FLEXIBLE PAVEMENTS</b>   |     |  |  |   |   |  |  |  |  |  |  | <b>9</b> |  |
| Rigid and Flexible Pavements- Components and their Functions Design Principles of Flexible and Rigid Pavements, Factors Affecting the Design of Pavements - ESWL, Climate, Sub-grade Soil and Traffic Design Practice for Flexible Pavements [CBR method, IRC Recommendations- Problems] Design Practice for Rigid Pavements – [IRC Recommendations-Problems]  |     |  |  |   |   |  |  |  |  |  |  |          |  |
| <b>UNIT IV HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE</b>   |     |  |  |   |   |  |  |  |  |  |  | <b>9</b> |  |
| Desirable Properties and Testing of Highway Materials: - (Tests have to be demonstrated in Highway Engineering Laboratory) Soil – California Bearing Ratio Test, Field Density Test, Aggregate - Crushing, Abrasion and Impact Tests Bitumen - Penetration, Ductility, Viscosity, Binder Content and Softening Point Tests. Construction Practice - Water Bound Macadam Road, Bituminous Road and Cement Concrete Road [as per IRC and MORTH specifications] Highway Drainage [IRC Recommendations]  |     |  |  |   |   |  |  |  |  |  |  |          |  |
| <b>UNIT V HIGHWAY MAINTENANCE</b>  |     |  |  |   |   |  |  |  |  |  |  | <b>9</b> |  |
| Types of Defects in Flexible Pavements – Surface Defects, Cracks, Deformation, Disintegration – Symptoms, Causes and Treatments. Types of Pavement Failures in Rigid Pavements – Scaling, Shrinkage, Warping, Structural Cracks, Spalling of Joints and Mud Pumping – and Special Repairs Pavement Evaluation – Pavement Surface Conditions and Structural Evaluation Overlay Design by Benkleman Beam Method [Procedure only]   |     |  |  |   |   |  |  |  |  |  |  |          |  |