

**ACADEMIC – GRADUATE STUDIES AND RESEARCH DIVISION**

**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI-HYDERABAD CAMPUS**

**SECOND SEMESTER 2021-2022**

# Course Handout

Date: 15-01-2022

In addition to Part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

*Course No.* : CE G570

## Course Title : Highway Construction Technology

## Instructor-in-Charge : SRIDHAR RAJU

**Scope and Objective of the Course:**

Road planning and reconnaissance; right of way selection; fixing of alignment; road construction techniques: construction staking, clearing and grubbing; subgrade construction: excavation and filling, compaction, preparation of subgrade, quality control tests as per MoRT&H specifications; granular subbase and base course construction: gravel courses, WBM, WMM, stabilized soil subbases, use of geo-textiles and geo-grids; construction of bituminous layers; concrete pavement construction. Hot mix asphalt plants, road construction equipment, material placement and compaction methods, shoulders, highway drainage and roadside requirements; State of the art construction management techniques, construction standards, quality control and quality assurance including contract documents and arbitration.

**Text Books:**

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| --- | --- |
| T1 | Kandhal Text book on Bituminous Road Construction in India, PHI, Revised Edition (2019). |
| T2 | MoRTH Book of specifications for Roads and Bridge works published by the IRC, Latest Revision, 2013, New Delhi |

**Reference Books:**

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| R1 | Coleman O'Flaherty (ed.) (2015) Highways, The Location, Design, Construction and Maintenance of Road Pavements, ICE Publishing 5th edition, ISBN: 9780727759931 |
| R2 | Rajib B. Mallick and Tahar El-Korchi, (2014) Pavement Engineering Principles and Practice, Second Edition, CRC Press. |
| R3 | Concrete Pavement Design, Construction, and Performance by Norbert J. Delatte, Second Edition, published by the CRC Press (2008). |
| R4  R5 | Relevant IRC publications.  Pavement Drainage Theory and Practice by G L Sivakumar Babu, Prithvi S Kandhal, Nivedya Mandankara Kottayi, Rajib Basu Mallick and A Veeraragavan, CRC Press (2020). |

**Course Plan:**

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| Lecture No. | Learning objectives | Topics to be covered | Chapter in the Text Book |
| 1-3 | Compaction of embankment, earthworks and sub-grades | Compaction of sub-grade and embankment, light and heavy laboratory compaction, factors affecting the field compaction, quality control and quality assurance, compaction equipment for road works | T2-section 200 and 300  T2-900 |
| 4 | Fly Ash in Embankment | Construction procedure, quality control, protection against various hazards | T2-section 300  IRC:SP:58-2001  T2-900 |
| 5 | Application of geo-synthetic in highway construction | Uses of Geosynthetics in road construction, QA/QC, MoRTH Specifications. Construction practices and case studies. | T2-700  T2-900 |
| 6-8 | Road construction in waterlogged areas and drainage | Road construction in waterlogged areas including the sub-surface drainage system for the capillary cut-off. | Ch.7 and 8-R1, Ch.6-R2, IRC:34-2011, IRC:SP:42-2014 and IRC:SP:50-2013 |
| 9-10 | Granular and Stabilised Bases and Subbase Courses | Construction of Granular Sub Bases (GSB) as per the MoRTH Specifications, QA/QC. Construction of stabilized sub-bases. Construction of WBM, WMM, CRM, DLC layers. Sub-sruface drainage construction will be emphasized. | T2-section 400  Ch. 6, R1, Ch. 7, R2, IRC:SP:89-2010, IRC:75-2015, R5 |
| 11-17 | Surface Courses and Interface treatments | Spraying of prime coat and tack coat. Construction of dense, gap and open graded bituminous mixes. Construction of new mixes like warm mix asphalt, micro surfacing, and bituminous mixes with waste materials (RAP, and waste plastic and crumb rubber). | T1-6,7, 8  R1 and R2 |
| 18-25 | Hot mix asphalt (HMA) production with emphasis on the type of hot mix plant (HMP) | The production process of bituminous mixes using a batch mix and a drum mix plant. Advantages and disadvantages of both the plants. Surface preparation, mixing, laying and compaction of bituminous mixes. Paving equipment, QA and QC. Roller types, method of compaction, factors affecting compaction, rolling joints, inspection of compacted mat, segregation, measurement of density, density specifications. Statistical methods for arriving at the QA. | T1, R1, R2 and Notes |
| 26-30 | Recycling of Asphalt Pavements | Advantages and disadvantages of recycling, full depth recycling, hot and cold in place recycling, milling and plant recycling. The use of double barrel drums for heating reclaimed asphalt pavement (RAP). Utilization of maximum percentage of RAP. | T1- 9, T2-section 519 |
| 31-35 | Concrete Road Construction | Concrete road construction including the tests on Concrete mixes, Construction equipment, Method of construction of joints in concrete pavements, QA and QC. Unconventional Pavements – Porous concrete, SCC, Roller Compacted Concrete etc. | T2-600, R2, R3, IRC:15 and IRC:SP:062-2014 |
| 36-42 | Contract documents and arbitration | Case studies shall be considered with the lectures from experts regarding the arbitration and the preparation of documents. | Guest Lecture from an Industry expert |

**Evaluation Scheme:**

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| --- | --- | --- | --- | --- |
| Component | Duration (mins) | Weightage (%) | Date & Time | Nature of Component |
| Midsem Exam | 90 | 25 | TBA | OB |
| Assignments |  | 15 | 3 (minimum) | OB |
| Class Quizzes |  | 10 | 2 (minimum) | OB |
| Project work |  | 15 | TBA | OB |
| Compre Exam | 120 | 35 | TBA | OB |

**Chamber Consultation Hour:**

Tuesday and Wednesday 5:00 to 6:30 PM

**Notices:**

Notices will be displayed on CMS and few important notices will also be displayed on the notice board of Civil Engineering Department

**Make-up Policy:**

1. Make-ups will be granted only for genuine reasons like medical emergencies. However, prior permission is a must.
2. Applications received 24 hours after the Quiz/examinations will not be entertained.
3. For medical cases, a certificate from the concerned physician of the Medical Centre must be produced. Cross verification will be done with Hostel Superintendent.

**Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Sridhar Raju

**INSTRUCTOR-IN-CHARGE**

**CE G570**