**17CE2206 - TRANSPORTATION ENGINEERING - I**

**(Civil Engineering)**

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| **Course Category**  | Professional Core | **Credits**  | 3 |
| **Course Type**  | Theory | **Lecture - Tutorial - Practical**  | 2-2-0 |
| **Prerequisite**  | None  | **Sessional Evaluation**  | 40 |
| **Semester End Exam. Evaluation**  | 60 |
| **Total Marks**  | 100 |

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| **Course Objectives** | 1. To discuss the importance of transportation engineering along with the basics of highway alignment.
2. To explain various highway geometric elements.
3. To discuss the suitability of bitumen and aggregate in pavement construction.
4. To explain different methods of flexible pavement design.
5. To understand the concepts of rigid pavement design
6. To explain methods of construction and maintenance of pavements.
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| **Course Outcomes** | CO1 | Explain the scope and functions of transportation engineering along with the concepts of highway alignment. |
| CO2 | Design highway geometric elements such as super elevation, sight distances, horizontal alignment and vertical curves. |
| CO3 | Perform tests on bitumen and aggregate for assessing their properties and judge their suitability as highway construction materials.  |
| CO4 | Design flexible pavements. |
| CO5 | Design rigid pavements. |
| CO6 | Understand the construction and maintenance procedures of WBM, Bituminous and C.C. pavements. |
| **Course Content** | **UNIT - I****HIGHWAY ENGINEERING:** Importance of transportation – Modes of transportation – Characteristics of road transport – Classification of roads – Highway alignment – Basic requirements – Controlling factors – Master plan and its phasing. **UNIT - II****GEOMETRIC DESIGN:** Important elements – Cross section elements – pavement surface characteristics, camber, width of pavement, kerbs, road margins, formation width, right of way – Sight distance – Factors affecting sight distance – Design of sight distance – Horizontal alignment – Design speed, super elevation, extra widening ,transition curves types – Gradient and types – Vertical curves.**UNIT - III****HIGHWAY MATERIALS:** Aggregates and bitumen **–** Desirable properties, tests and specifications, desirable properties of bitumen – Aggregate mixes.**UNIT - IV****DESIGN OF FLEXIBLE PAVEMENTS**: Types of pavements, components and their functions, design factors, group index – Design of flexible pavements – Group index method and IRC method based on CBR value.**UNIT - V****DESIGN OF RIGID PAVEMENTS:** Westergaard’s equations – IRC recommendations for design of concrete pavement slab – Thermal stresses and critical combination of stresses – Types of joints, joint filler materials, joint sealer materials.**UNIT - VI****CONSTRUCTION AND MAINTENANCE OF ROADS**: Construction and maintenance of WBM – Bituminous and concrete roads.**HIGHWAY DRAINAGE:** Importance, surface and sub-surface drainage methods. |
| **Textbooks and Reference Books** | **TEXTBOOKS:**1. Highway Engineering by Khanna, S.K. and Justo C.E.G.
2. Principles and Practice of Highway Engineering by Dr. L.R.Kadiyali.
3. Transportation Engineering Vol I by C Venkatramaiah

**REFERENCE BOOKS:**1. Guidelines for the Design of flexible pavements, IRC:37-1984.
2. Guidelines for the Design of rigid pavements for highways, IRC:58-1988.
3. Transportation Engineering, Vol. I by Vazirani and Chandola.
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