

4/4 B.Tech. EIGHTH SEMESTER

CE8T4B

PAVEMENT DESIGN AND ANALYSIS

Credits: 3

Lecture: 3 periods/week

Internal assessment: 30 marks

Tutorial: 1 period/week

Semester end examination: 70 marks

Pre-requisites: Transportation Engineering - 1

Learning objectives:

- To be able to learn about characterization of material and design factors of pavement.
- To be able to analyze the stresses and design the flexible and rigid pavement.
- To be able to study different types of pavement construction procedures.

Course outcomes:

At the end of course the student will be able to

1. Comprehend the material specifications and design factors of pavements
2. Analyze stresses in flexible and rigid pavements
3. Design of flexible and rigid pavements
4. Study the constructional operations and equipments
5. Comprehend the concept of strengthening of existing pavements and pavement management system

UNIT – I

DESIGN FACTORS

Types of pavement – Factors affecting design of pavements – wheel loads –ESWL Concept- tyre pressure – contact pressure, Material characteristics – Environmental and other factors.

MATERIAL CHARACTERISTICS

Highway Materials – Soil, Aggregate, Bitumen and Tar- Tests on aggregates – Aggregate Properties and their Importance- Tests on Bitumen – Bituminous Concrete-Requirements of Design Mix- Marshall's Method of Bituminous Mix design.

UNIT – II

STRESSES IN FLEXIBLE PAVEMENT

Stresses in flexible pavement – layered systems concept – one layer system – Boussinesq Two layer system – Burmister Theory for Pavement Design

STRESSES IN RIGID PAVEMENT

Stresses in rigid pavements – relative stiffness of slab, modulus of sub-grade reaction – stresses due to warping, stresses due to loads, stresses due to friction

UNIT – III

FLEXIBLE PAVEMENT DESIGN

CBR Method of Flexible Pavement Design- IRC method of flexible pavement design.-AASHTO Method of Flexible Pavement design, Australian Method of Flexible pavement design, Design of Airport pavements

RIGID PAVEMENT DESIGN

IRC method of Rigid pavement design – Importance of Joints in Rigid Pavements- Types of Joints – Use of Tie Bars and Dowell Bars. Design of RCC pavements

UNIT – IV

HIGHWAY CONSTRUCTION

Introduction – Construction of Earth Roads- Gravel Roads – WBM Roads- Bituminous Pavements- Cement Concrete Roads

ADVANCES IN HIGHWAY CONSTRUCTION AND CONSTRUCTION EQUIPMENTS

Steps in Construction- Reinforced Concrete Pavements – Soil Stabilization – Methods and Objectives- Soil-cement Stabilization and Soil-lime Stabilization, Earth moving equipments, Specific equipments for bituminous roads and specific equipments for concrete roads construction

UNIT – V

PAVEMENT MANAGEMENT SYSTEM

Need for Highway Maintenance- Pavement Failures- Failures in Flexible Pavements-Types and Causes-Rigid Pavement Failures- Types and causes- Pavement Evaluation-Benkleman Beam method- Strengthening of Existing Pavements-Overlays Design

STRENGTHING OF EXISTING PAVEMENT

Over lay design – Types of Overlays - Methods of Overlay – Importance of Highway Drainage – Design of Surface Drainage - Design of Sub Surface Drainage

Learning resources:

Text books:

1. Highway Engineering, (7th Edition) by Khanna S., Kand Justo C.J., Nemchand & Bros, New Delhi, 2000.
2. Principles and Practices of Highway Engineering by Kadiyali L.R and Dr.Lal N.B., Khanna Publishers, New Delhi, 2003.
3. Principles of pavement design Yoder, Jhon Willey & Sons, New Delhi, 2012.

Reference books:

1. IRC Code for flexible pavement – IRC – 37 -2001.
2. IRC Code for Rigid pavement – IRC – 58 – 2002.
3. Pavement Analysis and Design, (2nd edition) by Yang H. Huang, Pearson Education, Delhi, 2008.
4. Principles of Highway Engineering And Traffic Analysis, (4th edition) by Fred L. Mannering, Wiley student publication, India, New Delhi, 1990.
5. Construction planning, equipment and measures by Peurifoy R.L., Tata McGraw-Hill Publications, New Delhi, 2006.

e-learning resources:

<http://nptel.ac.in/courses.php>

<http://jntuk-coeerd.in/>