IV Year II Semester
Code: 17CE836

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PAVEMENT ANALYSIS AND DESIGN
(Dept.Elective-IV)

Course Learning Objectives

The objectives of this course are:

1. To know various factors affecting pavement design
2. To know various concepts for the stresses in pavements.
3. To understand material characterisation and mix design concepts.
4. To acquire design principles of flexible and rigid pavements.
5. To acquire design principles of shoulders, overlays and drainage.

Course Outcomes:

At the end of course, Student will be able to

1. Assess factors affecting pavement design
2. Determine stresses in pavements
3. Design bituminous mixes
4. Design flexible pavements using various methods
5. Design rigid pavements using various methods
6. Design shoulders, overlays and drainage.

SYLLABUS

UNIT-I

Factors Affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT-II

Stresses In Pavements: Vehicle-Pavement Interaction **:**Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements; Stress in Flexible Pavements : Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts;

Stresses in Rigid Pavements: Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars, Introduction to DAMA, KENLAYER & KENSLABS Programs

UNIT-III

Material Characterization & Mix Design Concepts: CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilization and Use of Geo Synthetics; Marshall's and Hveem's Methods of Bituminous Concrete Mix Design, Field Implications of Stability and Flow Values, Introduction to Super Pave Mix Design, IRC Cement Concrete Mix Design.

UNIT-IV

Design of Flexible Pavements: Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations, AASHTO, Road Note No 29 & IRC Methods, Design of Runways & Taxiways, Design of Low Volume Rural Roads

UNIT-V

Design Of Rigid Pavements: Calibrated Mechanistic Design Process, PCA,AASHTO& IRC Specifications, Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design, Rigid Pavement Design for Low Volume Rural Roads.

UNIT-VI

Design Of Shoulders, Overlays & Drainage: Shoulder Design Considerations, Traffic Prediction, Parking, Regular & Encroaching Traffic, Thickness Design Specifications for Flexible & Rigid Shoulders; Types & Design of Overlays: AI's Principal Component Analysis & IRC Methods of Overlay Design, Importance of Profile Correction Course; Pavement Drainage Concepts, Drainage Related Failures, Inflow-Outflow Concepts, Condition of Continuity, Surface and Sub Surface Drainage Design Specifications

Text Books:

1. Pavement Analysis and Design, Yang H. Huang, Pearson Education, Second Edition.
2. Principles of Pavement Design, Yoder. J. &Witczat Mathew, W. John Wiley & Sons Inc
3. Pavement Design, Srinivasa Kumar R, Universities Press, Hyderabad

References:

1. Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications
2. Pavement and Surfacing for Highway & Airports, MichealSargious, Applied Science Publishers Limited.
3. Principles of Transportation Engineering, PathaChakroborty and Animesh Das, PHI Learning Private Limited, Delhi
4. Dynamics of Pavement Structures, G. Martineek, Chapmen & Hall Inc.
5. Concrete Pavements, A.F. Stock, Elsevier, Applied Science Publishers
6. Pavement Evaluation Maintenance Management System, R Srinivas Kumar, Universities Press, Hyderabad.