

GUJARAT TECHNOLOGICAL UNIVERSITY
BE (CIVIL & INFRASTRUCTURE ENGINEERING)

PAVEMENT ANALYSIS AND DESIGN

SUBJECT CODE: 2184008

8th Semester

Type of course: Elective

COURSE OBJECTIVES

1. To Identify and categorize the factors affecting design and performance of pavements.
2. To make students understand the basic methods and concepts used to analyse flexible and rigid pavements.
3. To make the students understand the structural and functional requirements of flexible and rigid pavements.
4. To make students capable of designing flexible and rigid pavements design

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE	PA(M)	Viva	PA (I)		
3	2	0	5	70	30	30	20	150

Syllabus (Theory)

Contents:

Sr. No	Topics	Hrs.	% Weightage
1	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 Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.	8	20
2	Stresses In flexible Pavement: 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	8	20

	Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts.		
3	Stresses in Rigid Pavements: Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, and Stresses in Dowel Bars & Tie Bars.	8	20
4	Design of Flexible Pavements: Factors effecting Design. Deflection studies in Flexible Pavements. Present Serviceability Index. IRC guidelines for Flexible Pavements. Pavement Performance and methods- AASHTO and Asphalt Institute Method. Need for Overlays, Overlays design methods for Flexible and Rigid pavements.	8	20
5	Design of Rigid Pavements: Factors effecting Design - Wheel load & its repetition, subgrade strength & proportion, strength of concrete - modulus of elasticity. Reinforcement in slab. Design of joints. Design of Dowel bars. Design of Tie bars. IRC and AASHTO methods of Rigid Pavement design.	8	20
	Total	40	100

LEARNING OUTCOMES

After completion of the course the student will be able to

- To explain the various factors affecting design and performance of pavements.
- Calculate the stresses and deflection in flexible and rigid pavements.
- Design flexible and rigid pavements.

List of Experiments: Nil

Design based Problems (DP)/Open Ended Problem: Tutorial sessions along with Expert Talk.

REFERENCES:

1. Yoder, E.J., and Witzak, 'Principles of Pavement Design', 2nd ed. John Wiley and Sons, 1975.
2. Yang, 'Design of Functional Pavements', McGraw Hill Book Co.
3. Khanna and Justo, 'Test Book of Highway Engineering 'Nemchand brothers, Roorke-2004.
4. Huang, 'Pavement Analysis', Elsevier Publications
5. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers.

6. Pavement and Surfacing for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
7. Haas and Hudson 'Pavement Management System', McGraw Hill Book Co., New York.
8. HRB/TRB/IRC/International Conference on Structural Design of Asphalt Pavements.
9. Relevant IRC Publications 10. CMA Hand Book

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N	E Level	C
10	15	20	20	25	10

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above

Active Learning Assignments

Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.