

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT**COURSE CURRICULUM
COURSE TITLE: PAVEMENT DESIGN
(COURSE CODE: 3360608)**

Diploma Programmes in which this course is offered	Semester in which offered
Civil Engineering/ Transportation Engineering	Sixth Semester

1. RATIONALE

Roads are the dominant mode of transportation in India today. They carry almost 90 percent of the country's passenger traffic and 65 percent of its freight. However, most highways in India are narrow and congested with poor surface quality, and 40 percent of India's villages do not have access to all weather roads. Development of roads infrastructure required sound knowledge and competency of various road design aspects so that required type of pavements/road can be design. At diploma level, students are expected to study about different aspects of pavement design so as to develop their understanding in order to apply their knowledge in construction industry. There are many job opportunities in this sector in both Government Departments such as PWD (Road and Buildings), Municipal Corporations, National Highway Authority etc. in private sectors such as Contractors working in this area, housing societies etc. This course attempts to provide knowledge and skills for working in this area and hence an important course for civil engineers.

2. COMPETENCY

The course content should be taught and curriculum should be implemented with the aim to develop required skills in the students so that they are able to acquire following competency:

- **Design the road pavements of rigid and flexible type.**

3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- 1 Explain types of pavement
- 2 Explain functions of components of pavement
- 3 Explain factors affecting design of pavement
- 4 Identify different components of pavement and their functions.
- 5 Design flexible pavement
- 6 Explain stresses and joints of rigid pavement

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	S/T	P	C	ESE	PA	ESE	PA	150
3	0	2	5	70	30	20	30	

Legends: L-Lecture; S/T- Tutorial/Teacher guided theory Practice – Studio; P - Practical; C Credit; ESE - End Semester Examination; PA - Progressive Assessment

5. DETAILED COURSE CONTENT

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – 1 Introduction	1a. Explain requirement and objectives of pavement 1b. Distinguish between two types of pavements	1.1. Historical review of highway pavements 1.2. Objects and Requirements of Pavements 1.3. Types of Pavements Structure 1.3.1. Flexible Pavement 1.3.2. Rigid Pavement
Unit– 2 Pavement Components	2a. Explain functions of components of pavement 2b. Discuss evaluation of wearing course with examples.	2.1. Function of pavement components 2.1.1. Soil Sub-grade and its Evaluation 2.1.2. Sub-base and Base Courses and their Evaluation 2.2. Wearing Course and its Evaluation
Unit– 3 Factors Affecting Design of Pavements	3a. Explain factors affecting design of pavement 3b: Calculate design wheel load for at least three types of traffic loads.	3.1. Factors to be considered in design of Pavement 3.1.1. Design wheel load 3.1.2. Sub-grade soil 3.1.3. Climatic factors 3.1.4. Pavement Component Materials 3.1.5. Environmental factors
Unit-4 Design of Flexible Pavement	4a. Design a flexible pavement for different given loading conditions. 4b: Discuss key provisions of IRC recommendations for flexible pavement design. 4c: Determine future traffic volume as per IRC code for a given data.	4.1. Tyre pressure 4.2. Other factors 4.3. ESWL 4.4. Methods for Flexible Pavement design 4.5. IRC provisions for Flexible pavement design 4.6. Methods of traffic volume survey & their future volume predictions.
Unit – 5 Introduction to Rigid Pavement	5a. Explain stresses and joints of rigid pavement 5b. Discuss design considerations for rigid pavement design with examples	5.1 General design Consideration 5.2 Wheel load stresses, temperature stresses and combination of stresses 5.3 Design of Joints, Temperature stresses.

6. SUGGESTED SPECIFICATION TABLE WITH HOURS (Theory)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Introduction	2	2	4	-	6
2.	Pavement Components	6	3	5	-	10
3.	Factors Affecting Design of Pavements	6	2	2	6	10
4.	Design of Flexible Pavement	20	5	10	15	30
5.	Introduction to Rigid Pavement	8	2	5	7	14
Total		42	13	29	28	70

Legends: R = Remember, U = Understand, A= Apply and above Level (Bloom's revised taxonomy)

Note: This specification table shall be treated as only general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

7. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS.

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills (**outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

*Note: Here only outcomes mainly in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes** (as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. NO.	Practical/Exercise (outcomes in psychomotor domain)	Approx. Hours Required
1	Sketches:- 1 Typical C/S of different types of roads 2 Types of Joint in Rigid Pavement	4
2	Demonstration of following tests 1. Plate Bearing Test. 2. Field CBR Test.	4
3	Numerical on Design of Flexible Pavements for Highway	4
4	Numerical on Design of joints of Rigid Pavements For Highway	8
5	Seminar on relevant topics	8
Total Hours		28

8. SUGGESTED LIST OF STUDENT ACTIVITIES

- i. Visit to a road construction site, and prepare a technical report
- ii. Prepare models of flexible and rigid pavement
- iii. Conduct traffic volume survey as per IRC code
- iv. Refer and study the pavement related codes
- v. Each student to refer & study safe pavement design considerations of at least two developed countries & prepare report highlighting key features.

9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

- i. Show video films of high ways and other roads construction
- ii. Arrange expert lectures of reputed contractors and engineers working in roads construction and maintenance.
- iii. Discuss & debate strategies to reduce accidents related to traffic.

10. SUGGESTED LEARNING RESOURCES

A. List of Books

Sr. No.	Title of Book/Journals	Author	Publication
1.	Highway Engineering	S.K. Khanna & C. J. Justo	Nemchand & Bros., 7th Edition (2000).
2.	Principles and Practices of Highway Engineering	Dr.L.R.Kadiyali & Dr. N. B. Lal	Khanna publishers – (2003).
3.	Principles of pavement design	Yoder & wit zorac	Jhonwilley & Sons.
4.	IRC Code for flexible pavement – IRC – 37 -2001. IRC Code for Rigid pavement – IRC – 58 – 2002.		

B. List of Software/Learning Websites

- i. http://onlinemanuals.txdot.gov/txdotmanuals/pdm/pavement_evaluation.htm
- ii. <http://www.cdeep.iitb.ac.in/nptel/Civil%20Engineering/Transportation%20Engg%201/72-homes/28-home.html>
- iii. <https://www.youtube.com/watch?v=uJntLOgEHD4>

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. (Mrs.) S. B. Khara**, L.C.E., Government Polytechnic, Himmatnagar
- **Prof. (Mrs.) R. V. Bhatt**, L.C.E., Government Polytechnic for Girls, Ahmedabad
- **Prof. (Ms.) M. A. Milisia**, L.C.E., Government Polytechnic for Girls, Ahmedabad
- **Prof. D K Parmar** , Lecturer in App. Mech. BBIT , V V NAGAR

Co-ordinator and Faculty Members from NITTTR, Bhopal

- **Prof. M.C. Paliwal**, Associated Professor, Department of Civil and Environmental Engineering
- **Dr J. P. Tegar**, Professor and Head, Department of Civil and Environmental Engineering