

01TR0201: Pavement Design

Objective of the Course: Objectives of introducing this subject at first year level in Masters of civil engineering are:

- To make students aware of design procedure of different types of pavements.
- To give knowledge of failures in pavements and their preventive measures.
- To impart the knowledge of construction techniques of various category of roads.
- To impart the concepts of evaluation techniques of pavements along with strengthening techniques.

Credit Earned:4

Students learning outcomes:

After successful completion of the course it is expected that student will be able to..

1. Identify the type of pavement and understand the stress analysis for flexible and rigid pavements.
2. Analyse the stresses produced in the pavement using empirical design charts and formulas.
3. Analyse and design the pavements using IRC recommendations.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	CSE (M)	Internal (I)	Viva (V)	Term Work (TW)	
3	0	2	4	50	20	30	25	25	150

Detailed Syllabus

Sr No.	Title of the unit	Number of hours
1	Introduction	4
	Types of Pavement	2
	Various components of Flexible and Rigid Pavement	1
	Comparison of Highway and Runway Pavements	1

2	Pavement Stress Analysis	6
	Flexible pavement stress theories and analysis	3
	Rigid Pavement stress theories and analysis	3
3	Design of Flexible Pavement	10
	Concept of ESWL	2
	Factors affecting flexible pavement design	2
	Various methods of design : GI method, CBR method	4
	Bituminous Mix design	2
4	Design of Rigid Pavement	10
	Concept of EWLF	2
	Design of Joints in Rigid pavements	4
	Temperature stress calculation in Rigid pavement	4
5	Pavement Failures and Strengthening	6
	Failures in flexible and rigid pavements	1
	Pavement evaluation and deflection survey	2
	Pavement maintenance: routine and periodic	2
	Design of overlays	1

Suggested lists of experiments

1. Plate Bearing Test.
2. Field CBR Test.
3. Pavement Evaluation by Benkelman Beam Method.
4. Road Unevenness Measurement by Bump-Integrator.
5. Marshall Stability Test

Suggested Theory Distribution

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	15%	10%	35%	20%	10%

Instructional Method and Pedagogy:

1. Use of Learning Management system like canvas
2. Demonstration through ppt and videos and lectures
3. Brainstorming and group discussion sessions
4. Collaborative learning

Recommended Study Material:**Reference Book:**

- 1 E.J.Yoder and M.W.Witczak, Principles of Pavement Design, John Wiley and Sons, New York, 1975
2. Tang, Pavement Design
3. Sharma & Shrama, Principles and Practice of Highway Engg.
4. IRC- 37, 2001, IRC - 58-2000.
5. Y.H.Huang, Pavement Analysis and Design. Prentice Hall, Englewood Cliffs, New Jersey, USA, 1993, ISBN-0-13-655275-7
6. H.N.Atkins, Highway Construction and Maintenance, Soils, and Concretes, Reston Publishing Company, Reston VA, 1983.
7. J.P.Watson, Highway Construction and Maintenance, Longman Scientific and Technical, New York, 1989.
8. Relevant IRC, BIS, AASHTO and PCA Specifications and Guidelines.
9. Kadiyali L.R. and Lal, N. B., Principles & Practice of Highway Engineering, Khanna Publishers, Delhi.
10. Khanna S.K., Justo C.E.G., Highway Engineering, Nem Chand & Bros., Roorkee.
11. Partho Chakraborty and Animesh Das, Principles of Transportation Engineering, PHI
12. F. L. Mannering, W. P. Kilareski and S. S. Washburn, Principles of Highway Engineering and Traffic Analysis. Wiley India Pvt. Ltd., New Delhi.

Web Resources**Pavement engineering NPTEL course:**

<https://nptel.ac.in/courses/105101087/19>