GUJARAT TECHNOLOGICAL UNIVERSITY
CIVIL (TRANSPORTATION ENGINEERING) (13)
PAVEMENT DESIGN, CONSTRUCTION AND EVALUATION
SUBJECT CODE: 2721302
M.E. 2nd SEMESTER

Type of course : Core Course

Prerequisite : Nil

Rationale :

The Indian Government has set ambitious plans for upgrading of the National Highways in a phased manner. It is required to upgrade the knowledge of current practices in design of pavement structures. The objective of the course is to introduce the basic concepts of analysis and design of pavement structure. It includes the study of various types of failures of pavement and its remedial measures. It is necessary to reduce the cost of repairs and maintenance. The knowledge of construction techniques of various types of roads is backbone for the students. Various evaluation techniques are also covered in the course.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks		Practical Marks				
				ESE (E)	PA (M)	ESE (V)		PA (I)		
L	T	P	C			ESE	OEP	PA	RP	
3	2#	2	5	70	30	20	10	10	10	150

Content:

Sr.No.	Topics	Teaching Hrs.	Module Weightage
1	Types of Pavments – Rigid, Flexible, Highway-Runway Comparison.	3	5%
2	Stresses in Flexible Pavements – Theories, Analysis.	5	10%
3	Stresses in Rigid Pavements – Theories, Analysis.	5	10%
4	Design of Flexible Pavements –ESWL, Tyre Pressure, Other Factors, Various Methods for Highway and Runways Design, Mix Designs – Bituminous Mixes, Admixtures, Marshall Stability Test, Results, Control.	10	20%
5	Design of Rigid Pavements – EWLF, Other Factors Various Methods for Highways and Runways, Design of Joints, Temperature stresses. Pre-stressed Concrete Pavements.	10	20%
6	Highway Construction Methods: Embankment, Sub- Base, Base and Surface Courses, Flexible Pavements, Rigid Pavements. Materials for road construction, Specification and tests, Macadam construction, surfacing and surface treatment, Road Work in Desert, Swampy, Hilly Area in Problematic Situation.	5	20%
7	Surface and Subsurface Drainage.	2	5%
8	Pavement evaluation and strengthening: Failures in flexible and rigid pavements, pavement evaluation, deflection survey, serviceability rating techniques, strengthening techniques, maintenance, overlays, replacements.	5	10%

References:

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.

Course Outcomes:

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

Practical work:

List of tests/ practical are given below:

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

List of Tutorials:

1. Problems based on analysis for Flexible and Rigid pavement.
2. Tutorials based on design of Flexible Pavements for Highway and Runway.
3. Tutorials based on design of Rigid Pavements for Highway and Runway.
4. Tutorials based on design of Overlays.
5. Tutorials based on the pavement evaluation and strengthening.

Open Ended Problems:

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the

presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website