



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Civil Engineering (Transportation Engineering)

Subject Code: ME02069141

Subject Name: Pavement Management System

w. e. f. Academic Year:	AY 2024-25
Semester:	2
Category of the Course:	Professional Elective Course

Prerequisite:	Transportation Engineering, Traffic Engineering
Rationale:	Pavement Management System (PMS) is critical for efficient maintaining and managing roadway infrastructure, focusing on optimizing pavement performance over its lifespan. Effective maintenance of roads is required to provide long term and consistent quality of service, which in turn results into additional benefits like reduction in operating costs and increase in useful life of pavement structure. PMS addresses the following key aspects such as economic efficiency, safety and service quality, resource allocation and prioritization, data collection and analysis, lifecycle perspective.

Program Outcomes

No	Program Outcomes
01	Engage in critical thinking and research to develop solutions to multifold real-world problems.
02	Communicate effectively with the engineering community at large level on complex design tasks & write and present technical reports.
03	Demonstrate a high level of professionalism in handling multidisciplinary and complex traffic engineering problems.
04	Plan, assess, create, integrate, carry out, and oversee complex transportation infrastructure projects in a sustainable local and global context.
05	Address societal issues pertaining to transportation by offering technologically advanced, reasonably priced solutions while upholding high standards of ethics and professionalism.

Course Outcome:

After Completion of the Course, Student will be able to:

No	Course Outcomes	RBT Level
01	Recognize the components of a Pavement Management System and the data required.	U
02	Develop pavement deterioration models and strategies for pavement	A, N



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	rehabilitation and maintenance.	
03	Demonstrate, implement, and compare various methods of pavement structure rehabilitation and overlay designs.	A
04	Understand the implementation of Pavement Management Systems and the techniques used to collect necessary data.	U
05	Comprehend various software platforms and related concepts and be able to use them for research.	U, A

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1	Introduction of Pavement Maintenance & Management Process: Application of system concepts to pavement management, pavement management levels-network & project level, functions - data need pavement life cycle, assessment of pavement performance, combined measures of improving pavement quality, data management.	10	22
2	Determining Present and Future Needs: Establishing criteria – development of models for pavement deterioration, determining the future needs, rehabilitation and maintenance strategies, developing combined programmes for maintenance & rehabilitation.	11	24
3	Project Level Design: Framework for pavement design, characterization of physical design inputs, basic structural response models – variability, reliability and risk, generating alternate design strategies, rehabilitation design procedures, Overlay design, economic evaluation of alternate pavement design strategies, selection of optimal design strategy.	12	27
4	Implementation: Major steps in implementing PMS – pavement construction management & pavement maintenance management, data	12	27



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collection by latest techniques like drone surveys, and data collection vehicle (DCV). Data analysis by image processing, artificial intelligence and machine learning application. Research needs, cost and benefit of pavement management, future directions and need for innovations in pavement management. HDM applications, effects of climate changes, minimization of carbon emission, risk management and road safety benefits.		
Total	45	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
30	20	30	10	10	--

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

(a) Reference Books:

1. Haas R. C. G., Hudson W. Ronald, Zaniewski John P., Modern Pavement Management, Krieger Publishing Company, 1994
2. Oecd, Pavement Management Systems, O E C D 1987.
3. Shahin M. Y., Pavement management for airport, roads and parking lots, Chapman and hall 1994
4. Susan Brown, Pavement Management Systems, Transportation Research Board, 1993.
5. E.J. Yoder and M.W. Witzak, Principles of Pavement Design, John Wiley and Sons, New York, 1975
6. Sharma & Sharma, Principles and Practice of Highway Engg.
7. IRC37-2018 Guidelines for the Design of Flexible Pavements
8. IRC58-2015 Guidelines for the Design of Plain Jointed Rigid Pavements for Highways
9. IRC 117-2014 Guidelines for the Structural Evaluation of Rigid Pavement by Falling Weight Deflectometer.
10. IRC 115-2014 Guidelines for Structural Evaluation and Strengthening of Flexible Road Pavements Using Falling Weight Deflectometer (FWD) Technique.
11. MoRTH, Specifications of Road and Bridge Works, 5th Revision 2013
12. Y.H. Huang, Pavement Analysis and Design. Prentice Hall, Englewood Cliffs, New Jersey,



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USA, 1993, ISBN-0-13-655275-7

13. H.N. Atkins, Highway Construction and Maintenance, Soils, and Concretes, Reston Publishing Company, Reston VA, 1983.

14. J.P. Watson, Highway Construction and Maintenance, Longman Scientific and Technical, New York, 1989.

(b) List of Open-Source Software (May not be open source but useful for the subject)

1. HDM 4.2
2. FAA's Free Pavement Management Software PAVEAIR

(c) List of Tutorials:

1. Tutorials based on pavement management process
2. Tutorials based on data required for PMS
3. Tutorials based on rehabilitation and maintenance programme
4. Tutorials based on economic analysis

(d) List of Experiments

1. Data collection of pavement condition
2. Traffic volume count for EWLF.
3. O-D survey on the highway.
4. Forecasting of traffic.
5. Economic evaluation of pavement management.
6. Computer applications for the above problems.
7. Design of overlay on a selected stretch of highway with evaluation of the alternative designs.

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