PAVEMENT MANAGEMENT SYSTEMS

(Professional Elective-3)

II Semester

Course Code: 19CE2161

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Prerequisites: Transportation Engineering, Pavement Analysis and Design

Course Outcomes:

At the end of the course, the student will be able to:

CO1 Illustrate components Inventory of Pavement Management Systems.

CO2 Describe the process of Pavement Performance like Roughness & Structural evaluation.

CO3 Illustrate the Evaluation of Pavement Safety & Quality.

CO4 Explain the concepts of design alternatives, Rehabilitation and Maintenance.

CO5 Describe about Implementation of Pavement Management Systems.

UNIT-I: (10 Lectures)

INTRODUCTION: Definition - Components of Pavement Management Systems, Pavement Management Levels and functions: Network and Project levels of PMS Influence Levels- PMS Functions- Function of Pavement evaluation - Requirements of PMS;

Pavement Management Data Needs: Classes of Data Required - Importance of Construction and Maintenance History Data - Importance of Pavement Evaluation;

Inventory Data: Purpose of Inventory Data - Types of Inventory Data - Selection and Referencing of Pavement Management Sections -

Collecting and Processing Section and Network Data - Traffic and Truck Load Data.

Learning outcomes:

1. Illustrate Functions and Requirements of PMS (L4)
2. Discuss Pavement Management Data needs and Inventory data (L2)
3. Illustrate the purpose of inventory data of pavements (L4)

UNIT-II: (10 Lectures)

PAVEMENT PERFORMANCE: Serviceability-Performance Concept - Pavement Roughness - Equipment for Evaluating Roughness - IRI - Relating Roughness to Serviceability - Structural Condition – Non destructive Measurement and Analysis - Deflection Measurements - Ground Penetrating Radar - Destructive Structural Evaluation - Structural Capacity Index Concepts - Network versus Project Level Applications of Structural Capacity Evaluation; Pavement Surface Distress Condition Surveys: Purpose - Manual Methods of Survey - Automated Survey Methods - Types of Distress

Learning outcomes:

1. Illustrate Pavement Performance like Pavement Roughness (L4)
2. Explain Structural Evaluation and surface distress (L2)
3. Discuss the purpose of pavement surface distress condition survey (L2)

UNIT-III: (10 Lectures)

EVALUATION OF PAVEMENT SAFETY: Major Safety Components - Skid Resistance Evaluation - Basic Concepts of Skid Resistance and the importance of Pavement Texture - Methods of Measuring and Reporting Skid Resistance - Change of Skid Resistance with Time, Traffic and Climate;

Combined Measures of Pavement Quality: Concept - Combined Indexes
Database Management: Introduction - Key Components - Advantages of Integrated Data Base Management - Success Factors for Effective Data Base Management
Pavement Deterioration Models: Clarification of Performance and deterioration Prediction- Parameters to be Predicted - Types.

Learning outcomes:

1. Illustrate Evaluation of Pavement Safety and quality (L4)
2. Discuss about database management and pavement deterioration models (L2)
3. Explain the importance of skid resistance test (L2)

UNIT-IV: (10 Lectures)
REHABILITATION AND MAINTENANCE ALTERNATIVES: Identification of Alternatives - Pavement Preservation - Decision Process and Expert Systems Approach to identifying Feasible Alternative - Deterioration Modeling;
Priority Programming: Basic Approaches - Program Period - Functions - Methods - Budget Level Evaluation - Final Program Selection;
Framework for Pavement Design: Introduction - Focus on MEPDG - Structural Response Models - Characterization of Design Inputs - Variability, Reliability & Risk - Generating Alternative Design Strategies

Learning outcomes:

1. Illustrate Rehabilitation and Maintenance Alternatives and Priority Planning (L4)
2. Explain the Focus of MEPDG (L2)

3. Generate an alternative design strategies for a sample maintenance problem (L6)

UNIT-V: (10 Lectures)

MEPDG PROCESS FOR PAVEMENT DESIGN: Introduction - Calibration Issues - MEPDG Software - Levels of Use in the MEPDG - Life cycle pavement management - Principles - Design Inputs - Traffic Inputs - Climate Inputs - Pavement Performance;

MEPDG Rehabilitation of Existing Pavements: Introduction - Suggested Evaluation Data - Design with HMA - Design with PCC

Implementation of Pavement Management Systems: Key Components of Implementation - Role of Construction - Role of Maintenance - Research Management;

HDM-4: Functions - Structure - Program Analysis - Project Analysis;

Costs and Benefits of Pavement Management: Introduction - Quantifiable Benefits - Benefit/Cost of Developing and Using PMS – Examples

Learning outcomes:

1.Illustrate Economic Evaluation for optimal strategy and implementation (L4)

2. Discuss about HDM-4 and Cost-Benefits of Pavement Management (L2)

3. Explain the functions of HDM-4 (L2)

Text Books:

1. Ralph Haas, Ronald W. Hudson and Lynne Cowe Falls, ***Pavement Asset Management***, Scrivener Publishing (Wiley) Co. 2015.

2. Ralph Haas and Ronald W. Hudson, ***Pavement Management System***, McGraw Hill Book Co. 1978

References:

1. Ralph Haas, Ronald Hudson Zanieswki. ***Modern Pavement Management***, Kreiger Publications,2012.
2. Proceedings of North American Conference on ***Managing Pavement*** .
3. Proceedings of International Conference on ***Structural Design of Asphalt Pavements*** NCHRP, TRR and TRB Special Reports.