Birla Institute of Technology & Science, Pilani
Hyderabad Campus

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ACADEMIC GRADUATE STUDIES AND RESEARCH DIVISION

FIRST SEMESTER 2019-2020
Course Handout Part II

Date: 02-08-2019

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No.	: CE G548
Course Title	: Pavement Management Systems
Instructor-in-Charge	: V VINAYAKA RAM

Scope and Objective of the Course:

Up keeping the road infrastructure / assets in serviceable condition is very important from the point of view of providing best road network with optimal investments. Pavement is the biggest and most important asset among all the road assets. During this course, it is planned to discuss methods and means of pavement evaluation from the point of view of structural integrity, functional condition as well as safety of the road surface. Prioritisation of expenditure from the limited budget available needs many inputs. Pavement condition rating is the first step to achieve this objective. In this course, the road condition rating will be discussed at length and the students will be asked to rate a pavement to get a feel of the same. Rating manuals will be reviewed and the best rating manual will be adopted during the course. HDM 4 module will be introduced for the students to get the grip on prioritising the pavements for maintenance as well as life cycle cost analysis. Forecasting the future condition of the pavement needs performance as well as deterioration models to be covered. Also, data needs as well as other stages of overall pavement management at project and network levels will also be discussed during the course.

References:

1. Ralph Haas, Ronald Hudson, Zanieswki with Lynne Cowe Falls , “Pavement Asset Management’, Wiley, 2015.
2. Rajib Basu Mallick and Tahar El-Kochi, ‘Pavement Engineering: Principles and Practice’, CRC Press, 2013.
3. Shahin, M.Y, “Pavement Management for Airports, Roads and Parking Lots’, Springer, Second Edition, 2005.
4. NCHRP 215 – “ Pavement Management System Development”, Transport Research Board, 1979
5. NCHRP Synthesis 501 – “ Pavement Management Systems: Putting data to work – A Synthesis of Highway Practice, Transport Research Board, 2017
6. NCHRP 523 – “Optimal Timing of Pavement Preventive Maintenance Treatment Applications”, Transport Research Board, 2004

I. Course Plan

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
1-2	Pavement Management Process	Why Pavement management, Stages of Pavement Management System (PMS), project and network levels of pavement management and functions, applications of Pavement Management System as a planning and technology improvement tool	Chapter 1, 2 and 3 of R1; Web resources, Shared Material
3	Data Requirements: Overview	Overview of pavement management data needs; Inventory data	Chapter 5 of R1
4-6	Pavement Structural Condition Evaluation	Benkelman beam studies, Falling weight deflectometer studies on both flexible and rigid pavements; back calculation concepts	Chapter 8 of R1
7-9	Pavement Functional Condition Evaluation / Surface Distress Condition Evaluation	Pavement roughness concepts; Instrumentation used to assess pavement roughness, International roughness index and its importance in pavement management process	Chapter 9 of R1
10-11	Pavement safety Condition Evaluation	Pavement Texture, Importance of surface friction characteristics on pavement safety, Discussion on the methods of Evaluation of pavement safety,	Chapter 10 of R1
12-14	Combined Measures of Pavement Quality (Pavement Rating)	Combined measures of pavement quality, Discussions on Condition Indices and Serviceability Indices, Pavement condition rating, Introduction to pavement rating manuals by different agencies	Chapter 11 of R1
15-19	Pavement Performance and deterioration Models	Structural condition (Distress) Models, Functional Condition Models, Initiation models and Progression Models	Chapter 15 of R1and Journal articles
20-21	Determining Present and Future Needs and Priority Programming of Rehabilitation and Maintenance	Establishing criteria, prediction models for pavement deterioration, determining needs, rehabilitation and maintenance alternatives, priority programming of rehabilitation and maintenance, developing combined programs of maintenance and rehabilitation	Chapters 14 and 16 of R1
22-24	Rehabilitation Design and Economic Analysis	Generating alternate strategies of design and rehabilitation; Materials, construction and maintenance policy alternatives, consideration of preservation in pavement design and analysis procedures, economic evaluation of alternate pavement design strategies and selection of optimal strategies,	Chapters 17 and 18 of R1

25-28	Highway Development and Management Tools in pavement management	Introduction to HDM 4, Hands on practice with HDM 4 package, Case studies with multiple alternative options of construction and maintenance strategies	Chapter 19 and Chapter 33 of R1
29-31	Database Management	Integrated Database management, communicating the present status of pavement at network and project levels.	Chapters 12 and 13 of R1
32-35	Economic Evaluation of alternative pavement design and maintenance policies and selection of optimal strategy	Consideration of Environmental Costs in Selecting Alternative Strategies; Weighing Costs versus Environmental Benefits; Unique and/or Unpredictable Cost Factors; User Costs; Selection of an Optimal Strategy; Road User Cost Study report discussion	Chapter 25 of R1
36-40	Implementation of PMS	Implementation of Pavement Management System: Role of construction quality on performance, pavement preservation on maintenance needs; Emerging trends in road asset management; Urban Pavement Management System.	Chapters 27, 28 and 29 of R1
41-42	Introduction to PMS for Airports	Airport Pavement Inventory; Airport Pavement Inspection; Performance Modeling and Condition Analysis; Airport Pavement Work Planning; USDOT Federal Aviation Administration Support and Use of PMS; Detailed Pavement Management Applications; Application of GIS/GPS in Shanghai Airport Pavement Management System	Chapter 35 of R1 and R3

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid Semester test	90 min	25	3/10/2019 11 AM – 12:30 PM	CLOSED BOOK
Take Home and In-class Assignments (A Minimum of 5 assignments will be given)	-	15	-	OPEN BOOK
Term Paper Presentation	-	15	-	OPEN BOOK
Field based development activity	-	15	-	OPEN BOOK
Comprehensive Examination	180 min	30	9/12/2019 AN	CLOSED BOOK

Chamber Consultation Hour: Will be announced during the first class

Notices: Students are advised to look for notices in their respective CMS. Important notices will be put up in the Civil Engineering Department's notice board also.

Make-up Policy:

- Make up requests received on social networking platforms / SMS / WHATSAPP etc. will be ignored and no further action will be initiated. Written makeup requests with necessary documentary proofs only will be accepted.
- Make up will be granted only for genuine reasons and will be considered on a case to case basis. However, prior permission is a must.
- For medical cases, a certificate from the concerned physician from the Medical Centre/hospital must be produced. In addition, copies of the prescription should be submitted as a proof. Hostel office / warden / chief warden should certify that they have the information regarding the illness of the applicant.
- Made-up medical certificates / other proofs will be seriously considered and referred to disciplinary committee for further necessary action.
- Make up policy is applicable for Mid-semester test and the comprehensive examinations only. Other listed components will not have any scope for make-ups.

Academic honesty and academic integrity Policy:

Academic honesty and academic integrity are to be maintained by all of the students throughout the Semester and no type of academic dishonesty is acceptable. Students are encouraged to use anti-plagiarism software to check reports before submission.

INSTRUCTOR-IN-CHARGE
CE G548