



Birla Institute of Technology & Science, Pilani
Hyderabad Campus

INSTRUCTION DIVISION
FIRST SEMESTER 2020-2021
Course Handout Part II

Date: 10-08-2021

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 G574
Course Title : Pavement Maintenance
Instructor-in-Charge : V VINAYAKA RAM

Scope and Objective of the Course:

Up keeping the road infrastructure 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. Causes of distress in flexible and rigid pavements, failure of surface and subsurface drainage systems will also be discussed at length. This will be followed by the discussion on the importance of highway maintenance works and timely rectification of defects in flexible pavements, routine maintenance, preventive maintenance, periodic maintenance, special maintenance, emergency repairs, patching of potholes, strengthening and rehabilitation of road pavements. Under the domain of maintenance of rural roads, gravel roads, cell filled pavements and roller compacted concrete pavements will be covered. Also the aspect of maintenance of urban roads with special emphasis on thin and ultrathin white topping, cobble roads, interconnected block pavement, side drains and subsurface drainage layer and utility service lines, will be covered during this course. Retrofitting of dowel bars in rigid pavement also will be discussed at length.

Text Books:

1. Derek Pearson, "Deterioration and Maintenance of Pavements, Ice Publishing, 2012
2. Ralph Haas, Ronald Hudson, Zanieswki with Lynne Cowe Falls, "Pavement Asset Management", Wiley, 2015.

References:

1. IRC 82: 2015, First Revision, Code of Practice for maintenance of Bituminous Road Surfaces
2. IRC SP 83: 2018, First Revision, Guidelines for maintenance, repair and rehabilitation of cement concrete pavements
3. Feng Li, Jinyan Feng, Youxin Li, Siqu Zhou, Preventive Maintenance Technology for Asphalt Pavement, Springer, 2021
4. ACRP Synthesis 22, Common Airport Maintenance Practices, Transportation Research Board, Washington DC, 2011
5. R. Keith Moble, An Introduction to Predictive Maintenance, Second Edition, Butterworth Heinemann Publications, 2002
6. Shahin, M.Y, "Pavement Management for Airports, Roads and Parking Lots", Springer, Second Edition, 2005.
7. NCHRP 523 – "Optimal Timing of Pavement Preventive Maintenance Treatment Applications", Transport Research Board, 2004
8. NCHRP Synthesis 501 – "Pavement Management Systems: Putting data to work – A Synthesis of Highway Practice, Transport Research Board, 2017
9. Highway Rating manuals

Lecture No.	Learning objectives	Topics to be covered	Reference
1-3	Introduction to Overall Pavement Management Systems (PMS)	Introduction, scope and importance of PMS, Levels of PMS, systems approach to PMS, Importance of maintenance activity as a part of PMS	TB1, R1
4-6	Pavement Failures: Flexible Pavements	Identification, measurement, causative factors and remedies for all the varieties of failure under the headings of surface defects, deformation and disintegration of flexible pavements	R9
7-9	Pavement Failures: Rigid Pavements	Identification, measurement, causative factors and remedies for all the varieties of failure under the headings of joint spalling, faulting, polished aggregate, shrinkage cracking, pumping, linear cracking, durability cracking.	R9

10-12	Introduction to Pavement Structural Condition Evaluation Techniques	Importance of structural condition evaluation of pavements, benkelman beam technique for flexible pavement evaluation, falling weight deflectometer technique for both flexible and rigid pavements	TB1, TB2, R1, R2
13-15	Pavement Functional Condition Evaluation	Importance of functional condition evaluation of pavements, pavement roughness concepts; instrumentation used to assess pavement roughness, international roughness index and its importance, measurement of surface defects in both flexible and rigid pavements	TB1, TB2, R1, R2
16-17	Pavement safety Condition Evaluation	Pavement texture, importance of surface friction characteristics on pavement safety, discussion on the methods of evaluation of pavement safety	TB1, TB2, R1, R2
18-19	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	TB1, TB2, R1, R2
20-21	Introduction to Pavement Performance and deterioration Models	Structural condition (Distress) models, functional condition models, initiation models and progression models	Online resources, articles
22-24	Pavement Maintenance	Importance of maintenance; homogeneous sections by AASHTO's cumulative difference approach, types of maintenance – Preventive maintenance, minor rehabilitation, major rehabilitation, reconstruction; planning of maintenance activities	R1, R2
25-31	Pavement Maintenance and preservation of flexible pavements and flexible pavement preservation tools	Periodic maintenance: periodic renewals, need and importance of periodic renewals, planning and programming of renewals, identification of stretches to be renewed, types of renewal treatments, periodicity of renewal, rectification of profile at the time of renewal; pothole filling / patching, tools and equipment for pothole / patch repairs, modern mobile mechanized pothole filling/road patching technologies, arrangements for traffic and safety measures during road maintenance preventive maintenance: introduction, selection of preventive maintenance treatment, warrants for preventive maintenance, flexible pavement preservation	R1

		tools	
32-37	Pavement Maintenance and preservation of rigid pavements and rigid pavement preservation tools	Assessing maintenance needs, methods for repairing concrete pavements, crack sealing and joint resealing, crack stitching (cross stitching), partial-depth repair, full depth repair, slab stabilization, special techniques for rehabilitation of rigid pavements, repair materials, tools and plant, planning the maintenance operations, arrangement for traffic and safety, rigid pavement preservation tools	R2
38-41	Additional topics in pavement maintenance	Forensic investigations and their role in pavement maintenance, recycling with emphasis on RAP materials, advanced technologies in pavement maintenance (GPS, android apps, machine learning, IoT etc.), prioritization (marginal cost effectiveness analysis and incremental benefit / cost analysis) and optimization of pavement maintenance activities	Multiple resources (will be announced in the class)

Laboratory Engagement

1. Development of manuals for different pavement maintenance activities
2. Development of decision tree for various maintenance activities for flexible and rigid pavements
3. Case studies – (Narkatpalli-Addanki case, Begumpet airport rehabilitation case, Food corporation of India case study) – Depending on the time available, more case studies may be added
4. Landslides and their repercussion on road failures, relevant measures
5. Maintenance of road furniture / assets,
6. Thin white topping and ultrathin white topping as maintenance options
7. Hands on with HDM 4 software

Evaluation Scheme:

S.No .	Evaluation Component	Duration (Min)	Weightage (%)	Date & Time	Remarks
1	Mid semester Examination	90 min	25	22.10.2021 (1:30 PM to 3:00 PM)	CB
2	Comprehensive Examination	180 min	35	23.12.2021 (FN)	CB
3	Lab based Projects and Presentations	-	20	Throughout the semester	OB

4	Term Paper and Presentations	-	10	Throughout the semester	OB
5	Take home Assignments	-	10	Throughout the semester	OB

On-line extra consultation hour: Every Saturday: 2 PM to 3 PM

Notices: Students are advised to look for notices in their respective CMS.

Make-up Policy:

- Make up requests received on social networking platforms / SMS / WHATSAPP etc. will be ignored and no further action will be initiated. **Makeup requests through official mails 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 should be submitted as a proof. 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 tests 1, 2, 3 and the comprehensive examination only. Other listed components will not have any scope for make-ups. Students are advised to adhere to the schedules without fail

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 / assignments before submission.

INSTRUCTOR-IN-CHARGE
CE G574
Pavement Maintenance