Birla Institute of Technology & Science, Pilani
Hyderabad Campus

ACADEMIC – GRADUATE STUDIES AND RESEARCH DIVISION
BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI-HYDERABAD CAMPUS
SECOND SEMESTER 21-22

Course Handout Part II

Date: 15-01-2022

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 G518
Course Title	:	Pavement Analysis and Design
Instructor-in-Charge	:	V Vinayaka Ram

Description : Basic concepts in transportation planning, accessibility and mobility, land use interaction, government role in transportation planning. characteristics of travel and transport problems, transportation survey and data collection: planning, design and implementation, travel analysis zone (TAZ) development, traditional four-step modelling process, analysis of travel behaviour and demand: studying travel behaviour, analysing urban travel markets; innovations in transportation modelling: travel behaviour model, activity-based models. econometric modelling using rstudio, modelling travel demand with CUBE. Transportation Demand Management (TDM), Transportation System Management (TSM), Smart City Transportation Planning: Transit-Oriented Development (TOD), Pedestrian-Oriented Development, liveable street planning, multimodal transportation planning, shared mobility concepts, integrated transportation management and planning. transportation & energy, climate change, fuel choice and green mobility.

Scope and Objective of the Course:

This course primarily covers the analysis and design mechanisms for both flexible and rigid pavements in general. The Multi-layer analysis for flexible pavements and slab analysis for rigid pavements structures will be covered with the relevant theory as well as software interfaces. The structural design of the pavements is usually dictated by the requirements of parameters related to traffic, foundation as well as environmental factors. Many International agencies like American Association of Highway Transport Officials (AASHTO), Asphalt Institute (AI), Australian Road Board (ARB), Portland Cement Association (PCA) along with Indian Roads Congress have introduced the necessary guidelines to design the pavement structures. Apart from the IRC guidelines, which are being followed throughout India, Mechanistic Empirical Pavement Design Guide, published by AASHTO for both flexible and rigid pavement structures has become an important standard to be followed throughout the World. In this direction, the course is planned with IRC and AASHTO guidelines for the design of pavements. In addition, course also deals with

the prominent mechanisms available to design the structural overlays for the in-service failed flexible and rigid pavements. Drainage plays a very prominent role in up keeping the pavements in serviceable condition for long time. In this course, the drainage design will also be introduced to enable the student field ready.

Text Book(s)

T1. Yang H Huang (2010) Pavement Analysis and Design, Pearson, Prentice Hall, NJ, USA 2nd Edition

T2. AASHTO (2015) Mechanistic Empirical Pavement Design Guide – A Manual of Practice, USA, 2nd Edition

Reference Book(s)

R1. E. J. Yoder, M. W. Witczak (2004) Principles of Pavement Design, 2nd Edition, Wiley International

R2. Coleman O'Flaherty (ed.) (2015) Highways, The Location, Design, Construction and Maintenance of Road Pavements, ICE Publishing 5th edition, ISBN: 9780727759931

R3. Rajib B. Mallick and Tahar El-Korchi, (2014) Pavement Engineering Principles and Practice, Second Edition, CRC Press.

R4. Norbert J. Delatte, Concrete Pavement Design, Construction, and Performance, Second Edition, CRC Press.

R5. Papagiannakis A T, Masad E A (2008), Pavement Design and Materials, Second Edition, John Wiley and Sons

R6. ACI 325 – 12 R – 02, 2002, Guide for design of Jointed Concrete Pavements for Streets and Local Roads, American Concrete Institute, USA

R7. Norbert J. Delatte, 2014, Concrete Pavement Design, Construction and Performance, 2nd edition, CRC Press

R8. IRC:15-2015, IRC:37-2018, IRC:58-2015, IRC: SP:72-2015, IRC: SP:62-2014, IRC:115-2015, IRC:117-2015, IRC 81-1997, IRC SP 76 – 2015, MEPDG and other relevant codes of practices

Lecture No	Learning Objectives	Topics to be Covered	Chapter in the text book / References
1-3	Learn how to compute the stresses and strains at any point in a multi layered flexible pavement structure? Also should be able to identify locations where critical stresses and strains happen	Stresses and Strains in Flexible Pavements: Homogeneous Mass; Layered Elastic Systems Viscoelastic Solutions	Art 2.1 to 2.3 in T1 Chapter 3 in T1 for software
4-6	Learn how to compute the stresses and strains at any point in a rigid pavement structure due to curling, loading and friction. Also should be able to learn about	Stresses due to curling Stresses and Deflections due to Loading Stresses Due to Friction Concept of Dowels and Joints	Art 4.1 to 4.4 in T1 Chapter 5 in T1 for software

	why dowel and tie bars are needed in rigid pavements		
7-8	Learn how to arrive at a traffic load factor for the design of either flexible or rigid pavement. Should be able to forecast the traffic intensity for the chosen design period	Traffic Loading and Volume for Pavement Design: Equivalent Single-Wheel Load Equivalent Axle Load Factor Traffic Analysis and forecasting Design Traffic Estimation	Art 6.1 to 6.4 in T1 and relevant IRC codes
9-20	Should be able to design a multi layered flexible pavement structure by IRC, AASHTO MEPDG Methods	Flexible Pavement Design: IRC 37-2018 Method AASHTO MEPDG 2015 Method Design of Flexible Pavement Shoulders	Chapter 11 in T1 and relevant IRC, AASHTO codes of practices
21-30	Should be able to design a rigid pavement structure by IRC, AASHTO and MEPDG methods including low volume roads	Rigid Pavement Design: IRC 58-2015 Method MEPDG Method	Chapter 12 in T1 and relevant IRC, AASHTO codes of practices
31-40	Should be able to design structural overlays for both flexible and rigid pavement structures as a rehabilitation process	Flexible Pavement Overlay Design: Types of overlay design methods IRC Method of flexible overlay design AI Principle Component Analysis Method Flexible pavement overlay design using Falling weight deflectometer studies Rigid pavement overlay design: Thin white topping design with IRC: SP-76-2015 Rigid pavement overlay design using Falling weight	Chapter 13in T1 and relevant Codes of Practices

		deflectometer studies	
41-42	Learn how to design the drainage and also compute drainage capacity	<u>Drainage Design :</u> Methods of controlling the water in pavements, Drainage design and drainage capacity computations	Chapter 8 in T1

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of the Component
Mid Semester test	90 min	25	As per the time table	Partially OB + Partially CB
Comprehensive Examination	120 min	35	07th May 2022 - FN	Partially OB + Partially CB
Assignments	-	15	Throughout the semester	OB
Presentations (Seminars and Term Papers)	-	10	Throughout the semester	OB
Computer Lab Based Assignments with the standard software and other developmental activities	-	15	Throughout the semester	OB

Chamber Consultation Hour: Will be announced during the first class

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

Make-up Policy:

- Make up requests received on social networking platforms / SMS / WHATSAPP etc. will be ignored and no further action will be initiated. It shall be requested through mail communication along with all the suitable proofs.
- 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 will be 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 G518