MECHANICAL CHARACTERIZATION OF BITUMINOUS MATERIALS

MULTI-FACULTY

TYPE OF COURSE: Rerun | Elective | PG
COURSE DURATION: 12 weeks (24 Jan’ 22 - 15 Apr’ 22)
EXAM DATE: 23 Apr 2021

PRE-REQUISITES: This is a self-contained course for students and practitioners alike, and hence, no prerequisite is required. For those who do not have an undergraduate degree in civil engineering, familiarity with construction of bituminous pavements will be helpful.

INTENDED AUDIENCE: Highway Engineers

INDUSTRIES APPLICABLE TO: Engineering Staff working in Oil Refineries, Modified Bitumen Manufacturers, State, and Central Highways Departments and PWD, Ministry of Road Transport and Highways, and National Highways Authority of India.

COURSE OUTLINE:
Bituminous materials exhibit a complex mechanical response, and an understanding of the same is paramount in pavement engineering. This course will include introductory elementary linear viscoelasticity, and use that framework to introduce different grading system for bitumen. Use of polymers to enhance the rheological properties will be discussed along with the various test methods to quantify such improvement. Mechanical characterization of bituminous mixtures for modulus determination for design purposes as well as quantification for laboratory performance in rutting and fatigue damage will be discussed.

ABOUT INSTRUCTOR:
M. R. Nivitha is currently a faculty member in the Department of Civil Engineering, PSG College of Technology, Coimbatore. She received her Ph.D. from IIT Madras in 2016.

Neethu Roy is working as Asst. Dean (R&D) and Professor, Department of Civil Engineering, Mar Baselios College of Engineering and Technology, Kerala. She got her Ph.D. from IIT Madras during 2013.

A Padma Rekha is currently working as an Associate Professor in the department of Civil Engineering, SRM Institute of science and Technology. She received her Ph.D. degree from IIT Madras during 2013.

J. Murali Krishnan is currently a faculty member in the department of Civil Engineering, IIT Madras. He obtained his Ph.D. from IIT Madras during 1999 and was a post-doctoral research associate at Texas A&M University, College Station, USA from 1999 to 2004.

COURSE PLAN:
Week 1: Introduction to bituminous pavements and Overview of distresses
Week 2: Introduction to linear viscoelasticity
Week 3: Introduction of material functions for viscoelastic materials
Week 4: Influence of temperature on the linear viscoelastic response
Week 5: Introduction to refinery processing of bitumen
Week 6: Introduction to the grading system for bitumen
Week 7: Industry lecture on Dynamic Shear Rheometer - Dharmesh Gala from Anton Paar; Performance grading of bitumen
Week 8: Modifiers for bitumen; Performance characterization of modified bitumen
Week 9: Introduction to Bituminous Mixture and the associated volumetrics
Week 10: Stiffness modulus (van der Poel), dynamic modulus, and resilient modulus of bituminous mixtures - experimental protocol, and post-processing.
Week 11: Simulation of rutting of bituminous mixtures in the laboratory
Week 12: Simulation of fatigue damage of bituminous mixtures in the laboratory