

Course syllabus

Department of Civil Engineering, Indian Institute of Technology Madras

CE6032-GIAN 151003: Nondestructive Testing & Evaluation of Pavements from Cradle to Grave

Credit Distribution: C:3 L:0 T:0 P:0 E:0 O:0 TH:0

Course Type:Theory

Description:

i) Exposing the participants to the fundamentals of the state of the art and the state of practice in nondestructive testing and evaluation of the pavements, ii) Describing the basic theoretical and practical aspects of major nondestructive testing and evaluation iii) Discussing the aspects of pavement life cycle where the nondestructive testing and evaluation can be incorporated effectively and economically iv) Exposing the participants to practical problems and their solutions through case studies.

Course Content:

Module A (Day 1): Overview of Nondestructive Testing and Evaluation (NDT&E) Lecture A.1: Brief introduction to life cycle of pavements (construction, maintenance, rehabilitation, reconstruction strategies and data needs) Lecture A.2: Important parameters that impact life of rigid and flexible pavements (natural or stabilized subgrade, granular or stabilized subbase and bases, hot mix asphalt layer, concrete layer) Lecture A.3: Tools currently available for NDT&E of pavements (deflection methods, electric/electromagnetic methods, seismic/sonic methods, vibration methods including intelligent compaction)

Module B (Day 2): Fundamentals of Nondestructive Testing and Evaluation (NDT&E) Part 1 Principles, available devices, data collection processes, data reduction process for each method Lecture B.1: Deflection methods (Falling Weight Deflectometers, Light Weight Deflectometers) Lecture B.2: Electric/Electromagnetic methods (air-launched and ground coupled Ground Penetrating Radar, Nonnuclear moisture/density devices) Module B (Day 3): Fundamentals of Nondestructive Testing and Evaluation (NDT&E) Part 2 Lecture B.3: Seismic/sonic methods (Seismic Pavement Analyzer, Portable Seismic Analyzer and other devices) Lecture B.4: Other methods (Traffic Speed Deflectometers, Rolling Deflection Device, Intelligent Compaction Rollers, and other devices)

Module C (Day 4): Case Studies of proper and improper use of NDTs Lecture C.1: Construction quality control Lecture C.2: Acceptance testing Lecture C.3: Pavement monitoring for maintenance and rehabilitation Lecture C.4: Pavement evaluation for reconstruction.

Module D (Day 5): Demonstrations Lecture D.1: Field operation of devices (Falling Weight Deflectometer, Light Weight Deflectometer, Portable Seismic Analyzer, Ground Penetrating Radar and other devices)

Module E (Day 6): Hands-on Exercises Lecture E.1: Data Reduction with available software (Falling Weight Deflectometer, Light Weight Deflectometer, Portable Seismic Analyzer, and other devices based on availability)

Text Books:

1. Wightman, W. E.; Jalinoos, F.; Sirles, P.; Hanna, Application of Geophysical Methods to Highway Related Problems, Federal Highway administration, 2004.

2. Beln Riveiro, Mercedes Solla, Non-Destructive Techniques for the Evaluation of Structures and Infrastructure, CRC Press, 2016.

Reference Books: Relevant publications/codes from Federal Highway Administration, AASHTO, PIARC and Indian Roads Congress, Transportation Research Board, National Institute of Standards and Technology, Sandia National Laboratories and US Army Corps of Engineers.

Prerequisites:-Nil