

01TR0205: Advances in Pavement Materials and Construction

Objective of the Course: Objectives of introducing this subject at first year level in Masters of civil engineering are: The subject covers the study of advances in highway materials and construction.

- To understand the highway construction parameters.
- To impart knowledge to the civil engineering students on advances in highway material and construction.
- To make students understand about concepts of analysis of various steps included for pavement layers.
- To make students able to perform various test on soil, aggregates and bitumen.

Credit Earned: 4

Students learning outcomes:

After successful completion of the course it is expected that student will be able to:

- Create awareness about the advance material available for highway construction
- Justify the use of the advance material with the advantages
- Select various methods of construction of different types of roads and their components, specifications and tests thereof.
- Analyze the need of construction equipment and its use
- Know and identify the use of Advance materials and describe the procedure of advanced techniques in highway constructions.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	CSE (M)	Internal (I)	Viva (V)	Term Work (TW)	
3	0	2	4	50	20	30	25	25	150

Detailed Syllabus

Sr. No.	Title of the unit	Number of hours
1	High Performance Highway Construction Materials	
	Introduction, Use of waste materials: Fly ash, Slag, Recyclable waste, Other waste materials. Modified bituminous materials: PMB, EMB, NRMB, CRMB, IS requirements and testing procedures. Concrete: introduction, advantages, IS requirements, mineral admixtures, applications, Advances in pavement material, super pave, micro surfacing etc.	10
2	Highway Construction	
	Principles of road construction, preparation of embankment, : Formation cutting in ordinary soil and hard rock Ground improvements, construction procedure for GSB, DBM, SDBC etc. layers of roads	05
3	Bituminous pavement Construction	
	Prime , tack, seal coats, bituminous-bituminous penetration macadam, surface dressing, premix carpet and bituminous concrete Recycling of bituminous pavement materials Construction of earthen, gravel and water bound macadam, wet mix macadam roads	10
4	Cement Concrete Pavement Construction	
	Procedure for construction of base and sub base, tools and plants and required, Types of construction joints, Joints filler and sealer, reinforced, Pre-stressed, Vacuum dewatered pavement	10
5	Road Construction Machineries	
	Role of labor v/s machinery in road construction, Earthwork machinery ,Rock excavation machinery ,Transporting Equipment, Compaction Equipment , Bituminous concrete road equipment , Cement Concrete road making Equipment ,Equipment Usage charges	10

Suggested lists of Tutorials

1. Visit to Hot mix plant where modified bituminous materials or mixes are used.
2. Problems on bituminous mix.
3. Visit to road construction site where Fibre Reinforced Concrete or High Performance Concrete is used.

Suggested Theory Distribution

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	15%	10%	35%	20%	10%

Instructional Method and Pedagogy:

1. Use of Learning Management system like canvas
2. Demonstration through ppt and videos and lectures
3. Brainstorming and group discussion sessions
4. Collaborative learning

Recommended Study Material:**Reference Book:**

1. Kerbs and Walkes, "Highway Materials", McGraw Hill Book
2. Atkins & Harold, Highway Materials, Soils and concretes, Prentice hall Pearson
3. Walker and Martin. Asphalt Pavement Engg.
4. Kerbs and Walker, Highway Materials
5. HMSO, Soil Mechanics for Road Engineers
6. HMSO, Bituminous Materials for Engineers
7. MOST Standards for Highway constructions
8. Atkins Harold N., Highway Materials, Soils, and Concrete, Prentice Hall, 1996.
9. Kadiyali L.R. and Lal, N. B., Principles & Practice of Highway Engineering, Khanna Publishers, Delhi.
10. Various IRC codes for construction of Bituminous & Concrete Roads
11. Partho Chakraborty and Animesh Das, Principles of Transportation Engineering, PHI