



GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering- Transportation Engineering

Subject Code: 3721313

Semester – II

Subject Name: Advances in Transportation Engineering

Type of course: Major Elective - III

Prerequisite: NIL

Rationale: Transportation Engineering plays an important role in development of nation. The transportation cost, travel time, delay due to congestion etc. can be reduced if implementation of Intelligent Transportation System (ITS) is done in transportation. It is necessary to understand the current ITS techniques used in the transportation engineering. Objectives are to learn the recent advancements in Transport Systems, and to give the students to hands on experience on the various testing procedures of advanced pavement materials as per the IRC standards. The course also includes the study of various advanced materials used in the field to understand their property. It is necessary to understand the behavior of advanced transportation materials in the mix.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Intelligent Transportation System (ITS): Introduction, Advanced Traveler Information Systems; Advanced Traffic Management System, Transportation Network Operations; Commercial Vehicle Operations and Inter- modal Freight; Public Transportation Applications; Smart vehicles, Smart highways, Adaptive Traffic Control System, Incident management, Automatic Vehicle Identification and Classification, Vehicle Positioning System, Collision Warning System, Driverless vehicles, Electronic Toll Collection, ITS and road-pricing. ITS and regional strategic transportation planning, including regional architectures: ITS and safety, ITS and security, ITS as a technology deployment program, research, development and business models, ITS and sustainable mobility, travel demand management.	25
2	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. Modified Bitumen Emulsion and tests, Multi grade bitumen, Anti stripping additives, Microsurfacing: procedure, testing. Superpave: Binder specifications, Aggregates and testing, mixing, Gyratory Compactor. High performance mixes: Stone Matrix Asphalt (SMA), fibers, mix design. Porous Asphalt: mix, advantages. Fiber Reinforced Concrete: Steel, asbestos, glass, polymer, carbon, natural fibers, applications. High Performance Concrete:	20



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introduction, advantages, IS requirements, mineral admixtures, applications.	
	TOTAL
	45 Hr.

Suggested Specification table with Marks (Theory):

Distribution of marks weightage for cognitive level

Bloom's Taxonomy for Cognitive Domain	Marks Weightage (%)
Recall	10
Comprehension	20
Application	30
Analysis	20
Evaluate	10
Create	10

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Sumit Ghos and Tony Lee, Intelligent Transportation Systems, CRC Press, ISBN: 0849300673.
2. Chris Drane and C. R. Drane, Positioning Systems in Intelligent Transportation Systems, Artech House Publishers, ISBN: 0890065365.
3. Judy Mc Queen and Bob Mc Queen, Intelligent Transportation System and Architecture, Artech House Publishers, ISBN: 089006525X
4. Various relevant IS and IRC, ASTM, AASTHO codes manuals and specifications for construction of Bituminous & Concrete Roads.
5. S. Shah and S. Ahmad, High Performance Concretes and Applications, Butterworth Heinemann Publishers, ISBN: 0340589221
6. Wayne Lee and Kamyar Mahboub, Asphalt Mix Design and Construction: Past, Present, and Future State of the Practice: A Special Publication on the 150th Anniversary of ASCE, Publishers: ASCE, ISBN: 0784408424.
7. Mitra Sitansu S., "Decision Support Systems – Tools and Techniques", John Wiley
8. Callister WD, Jr., Adapted by R. Balasubramaniam, Materials Science and Engineering, An introduction, John Wiley & Sons

Course Outcomes: At the end of the course, Student will be able

Sr. No.	CO statement	Marks % weightage
CO-1	To make the students aware of recent advancement techniques applied in Transportation Engineering.	20%
CO-2	To Provide an understanding on Freight Transport, Modeling, Location of the Facility and its Management .	30%
CO-3	To give an idea of Intelligent Transportation System and its various	10%



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	applications, logic/algorithms for operation.	
CO-4	To provide knowledge of various advanced materials that can be used for highway construction considering their high performance at field.	30%
CO-5	Applications and the functionality of various bituminous mixes including the waste.	10%

List of Experiments/ Practical's:

1. Development of logic/algorithms for different ITS applications.
2. Tests on modified bituminous materials
3. Tests on modified bituminous mixes
4. Tests on fiber reinforced concrete

List of Tutorials:

1. Visit to BRTS and any other places where ITS is applied.
2. Visit to Hot mix plant where modified bituminous materials or mixes are used.
3. Visit to Microsurfacing application.
4. Visit to road construction site where Fly ash is used.
5. Visit to road construction site where Fiber Reinforced Concrete or High Performance Concrete is used.