



M.Tech. Transportation Engineering (Part-Time)
Scheme and Syllabus
Batch 2023 and Onwards
Department of Civil Engineering

Semester 1 st									Total Credits=9	
Sr. No.	Category	Subject Code	Course Title	Contact Hours			Maximum Marks		Total Marks	Credits
				L	T	P	Internal	External		
1.	Core Subject	MTTE-101	Advanced Traffic Engineering	3	0	0	40	60	100	3
2.	Core Subject	MTTE-102	Advanced Soil Engineering	3	0	0	40	60	100	3
3.	Department Elective	MTTE-111	Reinforced Soil Design & Construction	3	0	0	40	60	100	3
		MTTE-112	Transportation Economics & Finance)							
		MTTE-113	Transportation & Environment							
4.	Mandatory (Non-Credit)	SBS101C	Introduction to Shaheed Bhagat Singh and his co-patriots	1	0	0	S/US			
Total				10	0	0	120	180	300	9

Semester 2 nd									Total Credits=24	
Sr. No.	Category	Subject Code	Course Title	Contact Hours			Maximum Marks		Total Marks	Credits
				L	T	P	Internal	External		
1	Core Subject	MTTE-201	Highway Construction Material and Methods	3	0	0	40	60	100	3
2	Core Subject	MTTE-202	Application of GIS in Transportation Engineering	3	0	0	40	60	100	3
3	Core Subject	MTTE-203	Pavement Materials Testing Laboratory	0	0	2	30	20	100	2
Total				6	0	2	110	140	300	8

Sr. No.	Category	Subject Code	Course Title	Contact Hours			Credits
				L	T	P	
1.	Core Subject	MTTE-201	Highway Construction Material and Methods	3	0	0	3
Internal Marks: 40, External Marks: 60, Total Marks: 100							

Course Objectives: The course should enable the students to:

1. To get acquainted with quality assurance, and economic selection of pavement materials.
2. To be able to perform all the necessary lab tests required to be done on highway construction materials.
3. To familiarize the fundamentals of mix design and carry out mix design.
4. To study and evaluate the applications of the recent trends in the field of highway construction materials.

UNIT-I

Sub-grade Soil Characterization: Properties of sub-grade layers; different types of soils, Mechanical response of soil; Soil Classification; Index and other basic properties of soil.

Introduction to Soil Stabilization: Physical and Chemical modification: Stabilization with admixtures like cement, lime, calcium chloride, fly ash and bitumen. Grouting: Categories of grouting, Art of grouting, Grout materials, Grouting techniques and control.

UNIT-II

Aggregate Characterization: Desirable characteristics of Road aggregates, proportioning of aggregates, Artificial aggregates, Sustainability and availability of sound aggregates.

Bitumen and Bituminous Concrete Mix Characterization: Bitumen sources and manufacturing, Chemistry of bitumen, bitumen structure, Rheology of bitumen, Elastic modulus, Dynamic modulus, visco-elastic and fatigue properties, creep test, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes.

UNIT-III

Modified bitumen and Design of Bituminous mix: Crumb Rubber Modified bitumen, Natural rubber modified bitumen, polymer modified bitumen; Introduction to emulsified bitumen and its characterization; Long term and short-term ageing and its effect on bitumen performance, Tests to simulate ageing of bitumen viz. RTFOT and PAV. Desirable properties of bituminous mixes, Design of bituminous mixes: Modified Marshall's specifications, Bituminous Road construction Procedure

UNIT-IV

Cement Concrete Pavement: Types of cements and basic cement properties, Special cements; Quality tests on cement; Tests on cement concrete including compressive strength, flexural strength, modulus of elasticity and fatigue properties; Introduction to advanced concretes like self-compacted concrete, Light weight concrete, Roller Compacted Concrete for pavement application; IS method of cement concrete mix design with case studies; Role of different admixtures in cement concrete performance; Joint filers for Jointed Plain Cement Concrete Pavements and their characterization; Nano technology applications in cement concrete, Concrete road construction.

Course Outcomes: Upon completion of this course the student shall be able to:

1. Examine the properties of the highway materials and perform Bituminous Mix Design.
2. Determine the suitability of the concrete and bituminous mixes in compliance to codal provisions.
3. Reduce cost with minimum adverse impact on environment.

Books Recommended :

1. Principles of Transportation engineering by Chakroborty & Das, Prentice Hall, India
2. Highway Engg by S.K Khanna & CEG Justo, Nem Chand Bros., Roorkee
3. Principles and practices of Highway engg by L.R Kadyali, Khanna Publishers, Delhi. Edition 6.

Sr. No.	Category	Subject Code	Course Title	Contact Hours			Credits
				L	T	P	
1.	Core Subject	MTTE-102	Application of GIS in Transportation Engineering	3	0	0	3
Internal Marks: 40, External Marks: 60, Total Marks: 100							

Course Objectives: The course should enable the students to:

1. Expose the students to the concept of digital mapping, to make them aware of recent advancements/software in surveying like Remote sensing, digital photogrammetry, GIS, DIP etc.
2. To familiarize with map projections and working with co-ordinate systems
3. To get acquainted with data analysis of vector based and raster based data

UNIT-I

Modern Trends in Surveying and Mapping: Digital Mapping, Uses and applications, data collection techniques (Conventional and Nonconventional), Present Status in India and abroad.

Aerial Photogrammetry: Introduction, types, Stereoscopy, Scale of a photograph, flight planning, Mosaics, Crab & Drift, Overlap & Side lap.

UNIT-II

Geographical Information System (GIS): Introduction, advantages, objectives of GIS, Definitions of GIS, Components of GIS, Overlay analysis, Digital Terrain Modelling, Digital Elevation Model Applications of GIS in transportation engineering fields, Four M's, Elements of Image visualization

UNIT-III

Introduction to Remote Sensing (RS): Introduction, EM spectrum, Ideal RS System, Real RS System, Visual Image interpretation, active and passive remote sensing, Reflectance; spectral reflectance of land covers; Spectral characteristics of solar radiation; energy interaction in atmosphere; energy interactions with Earth's surface, Spectral reflectance curves, Resolution

UNIT-IV

Digital Image Processing (DIP): Introduction, Histogram and image statistics, Remote Sensing Image distortion and rectification: Radiometric errors and Geometric errors. Image Enhancement Techniques, Image classification – Supervised and Unsupervised classification, Formats

Global Positioning System: Introduction, GPS, DGPS, Applications, Software demonstrations and working GIS/RS software.

Course Outcomes: Upon completion of this course the student shall be able to:

1. Apply the concepts and analytical methods related to surveying
2. Use the various surveying equipment
3. Plan and execute surveying projects
4. Prepare a map and concepts of 3-D view
5. Identify the potential use of Remote Sensing and GIS in Civil Engineering

Books Recommended :

1. Geomatics Engineering, Manoj Arora and R C Barjatiya, Nem Chand Brothers, Roorkee.
2. Principles of GIS, Peter A. Burrough, Rachael A., Oxford University Press
3. Remote Sensing and Image Interpretation, Lillesand and Kiefer, Wiley Publishers
4. Surveying Vol. I & II, B.C. Punmia, A.K. Jain & Jain. Luxmi Publications (P) Ltd., New Delhi.
5. Principle Practices & Design of Highways Engg., S. K. Sharma. S. Chand Publishing , New Delhi.

Sr. No.	Category	Subject Code	Course Title	Contact Hours			Credits
				L	T	P	
1.	Core Subject	MTTE-203	Pavement Materials Testing Laboratory	0	0	2	2
Internal Marks: 30, External Marks: 20, Total Marks: 50							

Course Objectives: The course should enable the students to:

1. Have knowledge about the various tests which need to be carried out on soils, aggregate and bitumen for the design of bituminous mixes and pavements. Evaluation tests for pavement strengthening and use of software in highway development

List of Experiments:

1. Tests on Soils (Gradation, atterberg limits, OMC and CBR).
2. Test on Aggregates (Aggregate grading and Proportioning, Impact, Abrasion crushing, water absorption, specific gravity).
3. Tests on Bitumen and Bitumen Mixes (Marshall method of mix design and Bitumen content test).
4. Pavement Evaluation tests (Benkelman beam test).
5. To determine modulus of subgrade reaction (K-value) of rigid pavement.
6. Exposure to latest software.

Course Outcomes: Upon completion of this course the student shall be able to:

1. Knowledge about tests and bituminous mix design which will give the students added confidence when they go actually in the field.

Books/Codes Recommended :

1. Khanna, S. K., Justo, C. E. G., and Veeraragavan, A., Highway Materials laboratory Testing, Nem Chand & Brothers.
2. Relevant IRC and AASHTO Codes.