GURU KASHI UNIVERSITY

Master of Technology in Transportation Engineering
(MTE)

Session: 2023-24

Department of Civil Engineering

Graduate Outcomes of the Program

The programme emphasizes to civil engineering principles, including structural analysis, geotechnical engineering, transportation engineering, and environmental engineering. Depending on their chosen specialization, graduates often become experts in areas such as structural engineering, geotechnical engineering, water resources engineering, or transportation engineering.

PROGRAMME LEARNING OUTCOMES

After completing the programme, the Learner will be able to:

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Identify, formulate, review research literature, and analysis complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
6. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
7. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
8. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Programme Structure

Semester –I						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**Credit**
MTE101	Numerical Methods & Applied Statistics	Core course	4	0	0	4
MTE102	Highway Traffic Analysis & Design	Core course	4	0	0	4
MTE104	Transportation System	Core course	4	0	0	4
MTE103	Pavement Analysis & Design	Ability Enhancement	4	0	0	4
MTE105	Traffic &Pavement Engineering Lab	Skill Based	0	0	2	1
Discipline Elective-I(Any one of the following)						
MTE106	Intelligent Transportation Systems	Discipline Elective	3	0	0	3
MTE107	Advanced Engineering Geology					
		Total	**19**	**0**	**2**	**20**

Semester –II						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**Credit**
MTE201	Road Transport Management & Economics	Core Course	3	1	0	4
MTE202	Transportation Planning	Core Course	3	1	0	4
MTE203	Pavement Materials	Core Course	3	1	0	4
MTE204	Pavement Materials And Evaluation Lab	Skill Based	0	0	4	2
MCS220	English for Research Paper Writing	Value Added Course	2	0	0	2
Discipline Elective-I (Any one of the following)						
MTE205	Geographical Information Systems & Remote Sensing	Discipline Elective	3	0	0	3
MTE206	Environmental Impact Assessment					
Discipline Elective-II (Any one of the following)						
MTE207	Theory Of traffic Flow	Discipline Elective	3	0	0	3
MTE208	Mass Transportation System					
MTE209	Railway Infrastructure. Planning & Design					
		Total	**17**	**3**	**4**	**22**

Semester: III						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**No. of Credits**
MTE305	Airport Infrastructure Planning & Design	Core	4	0	0	4
MTE306	Research Methodology	Research Based	4	0	0	4
MTE307	Dissertation Phase-I	Research Based	0	0	20	10
MTE399	XXX	MOOC	-	-	-	4
		Total	8	0	20	22

Semester: IV						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**No. of Credits**
MTE402	Dissertation Phase-II	Research Based	0	0	0	20
		Total	**0**	**0**	**0**	**20**
		Grand Total	**44**	**3**	**26**	**84**

Evaluation Criteria for Theory Courses

A. Continuous Assessment: [25 Marks]

   i. Surprise Test (Two best out of three) - (10 Marks)
   ii. Term paper (10 Marks)
   iii. Assignment(s) (5 Marks)

B. Attendance (5 marks)
C. MST: [30 Marks]
D. End-Term Exam: [40 Marks]

Evaluation Criteria for Practical Courses

Performance of Each Practical (10 Marks)

Report (5 Marks)

Practical Viva (5 Marks)

Total (20 Marks) (Each Practical)

SEMESTER: I

COURSE TITLE: Numerical Method & Applied Statistics
COURSE CODE: MTE101

L	T	P	Credits
4	0	0	4

Total: 60 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Analyze the different samples of data at different level of significance using various hypothesis testing.
2. Develop a framework for estimating and predicting the different sample of data for handling the uncertainties.
3. Learn how to obtain numerical solution of nonlinear equations using Bisection, Newton – Raphson and fixed-point iteration methods.
4. Solve system of linear equations numerically using direct and iterative methods.

Course Contents

UNIT I **15 hours**

Linear system – Gaussian elimination and Gauss – Jordan methods – matrix inversion – Gauss seidel method – Nonlinear equations – Regulafalsi and Newton- Raphson methods – interpolation – Newton's and Lagrange's interpolation.

UNIT II **15 hours**

Linear Programming – Graphical and Simplex methods – Measures of central tendency, dispersion, skewness and Kurtosis – Probability – conditional probability – Bayes' theorem

Random variable – Two dimensional random variables – standard probability distributions – Binomial Poisson and normal distributions - moment generating function

UNIT III **15 hours**

Sampling distributions – confidence interval estimation of population parameters – testing of hypotheses – Large sample tests for mean and proportion – t-test, F-test and Chi-square test – curve fitting-method of least squares.

UNIT IV **15 hours**

Regression and correlation – rank correlation – multiple and partial correlation – analysis of variance-one way and two-way classifications – experimental design – Latin square design – Time series analysis

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. *Bowker and Liberman, Engineering Statistics, Prentice-Hall, 1972.*
2. *Venkatraman, M.K., Numerical Methods in Science and Engineering, National Publisher Company.*

COURSE TITLE: Highway Traffic Analysis & Design
COURSE CODE: MTE102

L	T	P	Credits
4	0	0	4

Total: 60 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Apply a compact foundation in the field of traffic engineering, its management in order to achieve the safety to the road users.
2. Apply the basic principles of traffic engineering in the design of traffic facilities based on traffic flow theory.
3. Analyze traffic system management in the urban area.
4. To estimate capacity and level of service for the rural and urban area.

Course Contents

UNIT I **15 hours**

Elements of Traffic Engineering -road user, vehicle and road way. Vehicle characteristics - IRC standards - Design speed, volume. Highway capacity and levels of service - capacity of urban and rural roads - PCU concept and its limitations - Road user facilities - Parking facilities - Cycle tracks and cycleways - Pedestrian facilities.

UNIT II **15 hours**

Traffic volume studies, origin destination studies, speed studies, travel time and delay studies, Parking studies, Accident studies.

Elements of design - Alignment - Cross sectional elements - Stopping and passing sight distance. Horizontal curves - Vertical curves. Design problems – Hill Roads.

UNIT III **15 hours**

Traffic regulation and control - Signs and markings - Traffic System Management - Design of at-grade intersections – Principles of design – Channelization - Design of rotaries - Traffic signals - pre-timed and traffic actuated. Design of signal setting - phase diagrams, timing diagram – Signal co-ordination.

UNIT IV **15 hours**

Grade separated intersections - Geometric elements for divided and access-controlled highways and expressways – Road furniture - Street lighting. Traffic Safety – Principles and Practices – Road Safety Audit.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

- *1.ITE Hand Book, Highway Engineering Hand Book, Mc Graw - Hill.*
- *AASHTO A Policy on Geometric Design of Highway and Streets*
- *R. J. Salter and N. B. Hounsel, Highway Traffic Analysis and Design, Macmillan Press Ltd, 1996.*

COURSE TITLE: Transportation System
COURSE CODE: MTE104

L	T	P	Credits
4	0	0	4

Total: 60 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Interpret the basic concepts of transportation and the importance of transportation.
2. Illustrate all modes and components of transport
3. Classify the integration of transportation.
4. Express the legal regulations related to land, air, sea and railway.

Course Content

UNIT I **15 hours**

Historical development of transport in India - 20-year Road Plans, National Transport Policy Recommendations, IRC, CRRI, Vision 2021, NHDP, PMGSY. Characteristics of different modes of transport and their integration and interactions - impact on environment.

UNIT II **15 hours**

Planning of railway - Passenger and goods terminals - layout - passenger facilities - traffic control.

Airport Planning-requirements and components. Design of runway and taxiway - Apron - parking configuration - terminal requirements - Airport marking and lighting - Air traffic control.

UNIT III **15 hours**

Planning of Harbours and ports - cargo handling - Containerization - Navigation aids - Inland waterways - Pipeline transportation.

UNIT IV **15 hours**

Urban transportation systems - Mass rapid transit system - Light rail transit - Personal rapidtransit, guided way systems, cabin taxi, dual mode bus - Para transit systems - Demand responsive system - Intermediate public transport.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. *Paquette, R.J., et al, Transportation Engineering Planning and Design, John Wiley & Sons, New York, 1982.*
2. *Alan Black, Urban Mass Transportation Planning, McGraw-Hill,*

COURSE TITLE: Pavement Analysis & Design
COURSE CODE: MTE103

L	T	P	Credits
4	0	0	4

Total: 60 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Comprehend the material specifications and design factors of pavements.
2. Analyze stresses in flexible and rigid pavements.
3. Design of flexible and rigid pavements.
4. Interpret the constructional operations and equipment's.

Course Contents

UNIT I **15 hours**

Introduction: Types and component parts of pavements, Factors affecting design and performance of pavements. Highway and airport pavements, functions of pavement components

UNIT II **15 hours**

Pavement Design Factors: Design wheel load, strength characteristics of pavement materials, climatic variations, traffic - load equivalence factors and equivalent wheel loads, aircraft loading, gear configuration and tyre pressure. Drainage – Estimation of flow, surface drainage, sub-surface drainage systems, design of sub-surface drainage structures

UNIT III **15 hours**

Flexible Pavement Design: Empirical, semi-empirical and theoretical approaches, design of highway and airport pavements by IRC, AASHTO Methods, applications of pavement design software.

Rigid Pavement Design: Types of joints and their functions, joint spacing; design of CC pavement for roads, highways and airports as per IRC, AASHTO, design of joints. Design of continuously reinforced concrete pavements. Reliability; Use of software for rigid pavement design.

UNIT IV **15 hours**

Pavement Management: Pavement failures, maintenance of highways, structural and functional condition evaluation of pavements, pavement management system.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. *Yoder and Witczak, Priniciples of Pavement Design, John Wiley and Sons*
2. *Yang. H. Huang, Pavement Analysis and Design, Second Edition, Prentice Hall Inc.*
3. *Rajib B. Mallick and Tahar El-Korchi, Pavement Engineering – Principles and Practice, CRC Press (Taylor and Francis Group)*
4. *W.Ronald Hudson, Ralph Haas and Zeniswki , Modern Pavement Management, Mc Graw Hill and Co*
5. *Relevant IRC Codes*

COURSE TITLE: Traffic & Pavement Engineering Lab
COURSE CODE: MTE105

L	T	P	Credits
0	0	2	1

Total:15 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Determine the various parameters affecting the pavement.
2. Test and analyze the properties of bitumen pavement.

Course Contents

List of Experiments:

1. Determination of specific gravity and water absorption of coarse aggregate.
2. Determination of particle size distribution.
3. Determination of aggregate impact value.
4. Determination of aggregate crushing value.
5. Determination of Los Angeles abrasion value of aggregates.
6. Determination of flakiness index and elongation index of coarse aggregate.
7. Determination of penetration value of bitumen.
8. Determination of softening point value of bitumen.
9. Determination of ductility value of bitumen.

COURSE TITLE: Intelligent Transportation Systems
COURSE CODE: MTE106

L	T	P	Credits
3	0	0	3

Total: 60 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Compare ITS & ATIS
2. Interpret about the Advanced Transportation Management System
3. Comprehend about APTS, CVO, new technology and ETC
4. Comprehend the regional architecture, integration of infrastructure and operational planning.

Course Contents

UNIT I **15 hours**

Introduction to Intelligent Transportation Systems (ITS) – Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection.

UNIT II **15 hours**

Telecommunications in ITS – Importance of telecommunications in the ITS system, Information Management, Traffic Management Centres (TMC). Vehicle – Road side communication – Vehicle Positioning System

UNIT III **15 hours**

ITS functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).

UNIT IV **15 hours**

ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management.

Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. *ITS Hand Book 2000: Recommendations for World Road Association (PIARC) by Kan Paul Chen, John Miles.*
2. *Sussman, J. M., Perspective on ITS, Artech House Publishers, 2005.*
3. *National ITS Architecture Documentation, US Department of Transportation, 2007 (CD-ROM).*

COURSE TITLE: Advance Engineering Geology
COURSE CODE: MTE107

L	T	P	Credits
3	0	0	3

Total: 45 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Classify the various geological agents and processes involved.
2. Identify the available minerals by their properties and behavior.
3. Classify and identify the available rock in the construction site.
4. Interpret the different geological features and their engineering importance and apply the geological concepts in civil engineering projects.

Course Content

UNIT I **15 hours**

PHYSICAL GEOLOGY: -

Geology in civil engineering – branches of geology; structure of earth and its composition; weathering of rocks – scale of weathering; soils landforms and processes associated with river, wind, groundwater and sea; relevance to civil engineering; Plate tectonics.

UNIT II **15 hours**

MINEROLOGY: -Physical properties of minerals – Quartz group, Feldspar group; Pyroxene - hypersthene and augite, Amphibole, hornblende; Mica – muscovite and biotite, Calcite, Gypsum and Clay minerals.

UNIT III **15 hours**

PETROLOGY: - Classification of rocks - distinction between Igneous, Sedimentary and Metamorphic rocks; Engineering properties of rocks- Description, occurrence, engineering properties, distribution and uses of Granite, Dolerite, Basalt, Sandstone, Limestone, Laterite, Shale, Quartzite, Marble, Slate, Gneiss and Schist.

UNIT IV **15 hours**

STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD: -Geological maps – attitude of beds, study of structures; folds, faults and joints – relevance to civil engineering; Geophysical methods – Seismic and electrical methods for subsurface investigations.

GEOLOGICAL INVESTIGATION: Remote sensing for civil engineering applications; Geological conditions necessary for design and construction of

Dams, Reservoirs, Tunnels, and Road cuttings; Coastal protection structures; Investigation of Landslides and earthquakes - causes and mitigation; seismic zonation – seismic zones of India.

Transactional Modes

Video based teaching, Group Discussion, Cooperative teaching, Demonstration, Open Talk

Suggested Readings:

1. *Parbin Singh, "Engineering and General Geology", S.K.Kataria& Sons, 2008.*
2. *Venkatareddy. D. Engineering Geology, Vikas Publishing House Pvt. Ltd. 2010*

SEMESTER: II

COURSE TITLE: Road Transport Management & Economics
COURSE CODE: MTE201

L	T	P	Credits
3	1	0	4

Total: 60 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Comprehend the issues & challenges in the Transportation Sector
2. Develop skills required for Transport planning & formulation.
3. Interpret the optimization techniques for Transport Planning & Pricing.
4. Analyze the processes for Transport project execution and control.

Course Contents

UNIT I **15 hours**

Motor Vehicles Act -statutory provision for road transport and connected organizations. Route scheduling, Freight transport, Vehicle scheduling, Optimum fleet size, Headway control strategies, Crew scheduling.

UNIT II **15 hours**

Depots and Terminals -Principles and types of layouts, Depot location, Twin depot concept, Crew facilities. Design of parking facilities – Bus terminal, bus stops and bus bays

UNIT III **15 hours**

Transportation costs - Supply and demand - elasticity of demand; Supply of transport services - Economics of traffic congestion - Pricing policy. Vehicle operating costs - Fuel costs - Maintenance and spares - Depreciation - Crew costs - Value of travel time savings - Accident costs.

UNIT IV **15 hours**

Economic analysis of projects - Methods of evaluation - Cost-benefit ratio, first year rate of return, net present value, and internal-rate of return methods; Indirect costs and benefits of transport projects.

Financing of road projects - methods – Private Public Partnership (PPP) - Toll collection - Economic viability of Build-Operate-Transfer Schemes – Risk Analysis - Case Studies.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. *Winfrey, Economic analysis for Highways, International Textbook Company, Pennsylvania, 1969.*
2. *CRRI, Road User Cost Study in India, New Delhi, 1982*
3. *IRC, Manual on Economic Evaluation of Highway Projects in India, SP30, 2007*

COURSE TITLE: Transportation Planning
COURSE CODE: MTE202

L	T	P	Credits
3	1	0	4

Total: 60 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Comprehend the urban transportation and illustrate planning.
2. Classify trip and demonstrate trip production models.
3. Interpret various split models on transportation engineering.
4. Analyze the land use between various transport means and suggest an alternative plan for land use.

Course Contents

UNIT I **15 hours**

Urban Transportation Planning - Goals and objectives - Hierarchical levels of transportation planning - Forecast - Implementation - Constraints. UTP survey - Inventory of land use.

UNIT II **15 hours**

Trip generation - Trip classification - productions and attractions - Multiple regression models - Category analysis - Trip production models - Trip distribution models - Linear programming approach.

UNIT III **15 hours**

Modal split models -Behavioral models - Probabilistic models - Utility functions - logit models - Two stage model. Traffic assignment - Assignment methods - Route-choice behavior - Network analysis.

UNIT IV **15 hours**

Land use and its interaction - Lowry derivative models - Quick response techniques - non-Transport solutions for transport problems. Characteristics of urban structure. Town planning concepts.

Preparation of alternative plans -Evaluation techniques - Plan implementation – Monitoring- Financing of Project – Case studies.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. *Hutchinson, B.G., Principles of Urban Transport Systems Planning, Scripta, McGraw-Hill, NewYork, 1974.*
2. *Khisty C.J., Transportation Engineering - An Introduction, Prentice Hall, India, 2002.*

COURSE TITLE: Pavement Materials
COURSE CODE: MTE203

L	T	P	Credits
3	1	0	4

Total: 60 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Comprehend the material specifications and design factors of pavements
2. Analyze stresses in flexible and rigid pavements
3. Design of flexible and rigid pavements
4. Comprehend the constructional operations and equipment's.

Course Contents

UNIT I **15 hours**

Subgrade soil - Soil composition and structure - Soil classification for engineering purposes- Origin, Classification, requirements, properties and tests on road aggregates.

UNIT II **15 hours**

Origin, preparation, properties and tests, constitution of bituminous road binders, requirements - Bituminous Emulsions and Cutbacks: Preparation, characteristics, uses and tests.

UNIT III **15 hours**

Bituminous Mixes: Mechanical properties - Resilient modulus, dynamic modulus and fatigue characteristics of bituminous mixes.

UNIT IV **15 hours**

Weathering and Durability of Bituminous Materials and Mixes - Performance based Bitumen Specifications - Superpave mix design method Cement Concrete for Pavement Construction: Requirements, design of mix for CC pavement, joint filler and sealer materials.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. *RRL, DSIR, Bituminous Materials in Road Construction, HMSO Publication, 1955*
2. *IS and IRC Publications on relevant topic.*

COURSE TITLE: Pavement Materials and Evaluation Lab
COURSE CODE: MTE204

L	T	P	Credits
0	0	2	1

Total: 15 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Interpret the properties of different pavement materials.
2. Conduct quality control tests on Cement.
3. Comprehend the importance of building components and building services.
4. Illustrate the impact of building construction on society and demonstrate awareness of contemporary issues.

Course Contents

List of Experiments:

Tests on Soils (Gradation, Atterberg limits, OMC and CBR

Test on Aggregates (Aggregate grading and Proportioning, Impact, Abrasion crushing, water absorption, specific gravity)

Tests on Bitumen and Bitumen Mixes (Marshall method of mix design and Bitumen content test)

Pavement Evaluation tests (Benkelman beam test)

Exposure to latest software

COURSE TITLE: Geographical Information Systems & Remote Sensing
COURSE CODE: MTE205

L	T	P	Credits
3	0	0	3

Total: 45 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Interpret the concepts of Photogrammetry and compute the heights of objects
2. Comprehend the principles of aerial and satellite remote sensing, Able to comprehend the energy interactions with earth surface features, spectral properties of water bodies.
3. Apply knowledge of GIS software and able to work with GIS software in various application fields
4. Illustrate spatial and non-spatial data features in GIS and understand the map projections and coordinates systems

Course Contents

UNIT I **15 hours**

GIS Definition –Map and map analysis – Automated cartography – History and development of GIS – Hardware requirement – Type of data – Spatial and non- spatial data – Data structure– Vector and raster – Files and data formats – Data compression.

UNIT II **10 hours**

Spatial analysis –Data retrieval – Query – Overlay – Vector data analysis – Raster data analysis – Modelling in GIS – Digital Elevation Model – DTM – Types of output data – Output devices – Sources of errors – Types of errors – Elimination – Accuracies - The Global Positioning system and its applications.

UNIT III **10 hours**

Concepts and foundations of remote sensing - electromagnetic spectrum - EMR interaction with atmosphere, water vapour, ozone - Basic principles of photogrammetry – Spectral Signature and Spectral Signature curves - Remote sensing platforms and sensors.

Satellite system parameters, sensor parameters, earth resources and meteorological satellites, microwave sensors, Data Acquisition and interpretation - Visual Image Interpretation – Visual Image Interpretation Equipment - Digital Image Processing – Classification

UNIT IV **10 hours**

Applications in Survey, mapping and monitoring of land use/land cover - Transportation planning - Infrastructure development - Natural resources management - Urban Planning, Environment - Coastal Zone Management – Air Quality - Development of Resources Information Systems.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. *Burrough P.A. and Rachel A. McDonell, Principles of Geographical Information Systems, Oxford Publication, 2004.*
2. *C.P. Lo and Albert K. W. Yeung, Concepts and Techniques of Geographical Information Systems, Prentice- Hall India, 2006.*
3. *Thomas. M. Lillesand and Ralph. W. Kiefer, Remote Sensing and Image Interpretation, John Wiley and Sons, 2003.*

COURSE TITLE: Environmental Impact Assessment
COURSE CODE: MTE206

L	T	P	Credits
3	0	0	3

Total: 45 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Identify the objectives and scope of EIA
2. Illustrate the necessity of public participation in EIA studies
3. Summarize the importance of Environmental Attributes
4. Quantify impacts for various developmental projects

Course Contents

UNIT I **15 hours**

INTRODUCTION TO EIA: Definition, Evaluation of EIA in INDIA, Rapid and Comprehensive EIA, EIA, EIS, FONSI and NDS. Need for EIA studies, Baseline data, Step-by-step procedure for conducting EIA, Advantages and Limitations of EIA, Hierarchy in EIA, Statutory requirements in EIA, MoEF guidelines in siting Developmental Projects.

UNIT II **10 hours**

OBJECTIVES AND SCOPE OF EIA: Contents of EIA, Methodologies and Evaluation Techniques of EIA, Selection for specific projects

PUBLIC PARTICIPATION IN EIA: Elements of Effective Public Participation, Benefits and Procedures, EMP and DMP, Environmental Information System, Environmental Monitoring Systems, Public information network

UNIT III **10 hours**

ENVIRONMENTAL IMPACT CASE STUDIES-Case studies on Human impact on Himalayan Ecosystem, Urban solid waste management with reference to Hyderabad City, Irrigation impacts of Upper Thunga Project (UTP) at Shimoga, Impact on air quality due to cement making – A case study of ACC limited, Madhukkarai, Coimbatore, Bhopal Gas tragedy.

UNIT IV **10 hours**

IMPACT QUANTIFICATION: Impact quantification study on - Water resource Developmental projects, Hazardous waste disposal sites, Sanitary land filling, Mining projects, Thermal/Nuclear power plant and pharmaceutical industries

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

- *Environmental Impact Analysis, Urban & Stacey, Jain R.K.*
- *Environmental Impact Assessment, Mc Graw Hill Inc, L.W. Canter (1996)*
- *Environmental Impact Assessment and Management, Daya Publishing house, Hosetti B.B., Kumar A. (2014)*

COURSE TITLE: Theory of Traffic Flow
COURSE CODE: MTE207

L	T	P	Credits
3	0	0	3

Total: 45 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Interpret the main characteristics of traffic flow
2. Represent traffic phenomena using different methods and tools
3. Select and apply appropriate methods and techniques for analyzing traffic-related problems
4. Interpret and elaborate different type of traffic data

Course Contents

UNIT I **15 hours**

Traffic stream parameters - Fundamental diagram of volume-speed-density surface. Discrete and continuous probability distributions. Merging maneuvers - critical gaps and their distribution.

UNIT II **10 hours**

Macroscopic models - Heat flow and fluid flow analogies - Shock waves and bottleneck control approach.

UNIT III **10 hours**

Microscopic models -Application of queuing theory - regular, random and Erlang arrival and service time distributions - Waiting time in single channel queues and extension to multiple channels.

Linear and non-linear car following models - Determination of car following variables - Acceleration noise.

UNIT IV **10 hours**

Geographical Information System– Global Positioning System – Intelligent Transportation Systems - Area Traffic Control – Automatic Toll Collection – Smart Cards – Collision Detection System.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. *Drew, D.R., Traffic Flow Theory and Control, McGraw Hill., 1978.*
2. *TRB, Traffic Flow Theory - A Monograph, SR165, 1975.*

COURSE TITLE: Mass Transportation System
COURSE CODE: MTE208

L	T	P	Credits
3	0	0	3

Total: 45 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Comprehend the basics of urban, town, transportation planning and existing system
2. Collect the data and analyze for travel demand forecasting for horizon year by four stage modeling.
3. Classify mass transportation system in urban area with performance measurement.
4. Interpret the goods/freight movement in urban area and identify the factors affecting.

Course Contents

UNIT I **15 hours**

Urbanization, urban class groups, transportation problems and identification, impacts of transportation on urban development, urban transport system planning process. Introduction to Preparation of comprehensive plan and transportation system management planning. Urban forms and structures: point, linear, radial, poly-nuclear

UNIT II **10 hours**

Urban mass transportation systems: urban transit problems, travel demand, types of transit systems, public, private, para-transit transport, mass and rapid transit systems, BRTS and Metro rails, capacity, merits and comparison of systems, coordination, types of coordination

UNIT III **10 hours**

Survey and data collection for urban land use and transportation planning models, Study area definition; division into traffic analysis zones; network identification and coding; types of trips, socio economic and trip characteristics of urban area; home interview survey/ Household Information Survey; roadside interview survey; goods transportation information survey, mass transit survey, Intermediate public transport/IPT surveys; methods of sampling and expansion factors; accuracy checks, screen line checks, consistency checks.

UNIT IV **10 hours**

Mass transit systems: Introduction to routing and scheduling, parameters to measure performance of transit system. Corridor identification and corridor screen line analysis. As per developments suitability of transit system

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. *Kadiyali L.R., Traffic Engineering and Transport Planning, Khanna Publishers*
2. *Khisty, C J., Transportation Engineering – An Introduction, Prentice-Hall, NJ*
3. *S.C. Saxena, Traffic Planning and Design, Dhanpat Rai Pub., New Delhi.*

COURSE TITLE: Railway Infrastructure. Planning & Design
COURSE CODE: MTE209

L	T	P	Credits
3	0	0	3

Total: 45 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Illustrate the Railway planning, design, construction and maintenance and planning and design principles of Airports and Harbor's.
2. Illustrate the basic procedure of railway construction and its maintenance
3. Illustrate the planning of airport and its components in layout.
4. Comprehend the airport design and interpret the basic needs in the airport construction.

Course Contents

UNIT I **10 hours**

Planning of Railway Lines Network Railways operational system, historical background of Indian railways, plans and developments, policy and standards, traffic forecast and surveys, railway alignment, project appraisal and organization setup.

UNIT II **10 hours**

Component of Railway Track and Rolling Stock Permanent way, forces acting, rails, function of rails, rail fixtures and fastenings, sleepers and ballast, rail joints, elements of junctions and layouts, types of traction, locomotives and other rolling stock, brake systems, resistance due to friction, wave action, wind, gradient, curvature, starting, tractive effort of a locomotive, hauling power of a locomotive.

UNIT III **15 hours**

Track Construction and Maintenance Special considerations and construction practices, track laying, inspection and maintenance, maintenance tools, maintenance of rail surface, track drainage, track circuited lengths, track tolerances, mechanized method, offtrack tampers, shovel packing, ballast confinement and directed track maintenance, bridge maintenance, renewal, classification of renewal works, through sleeper renewals, mechanized relaying, track renewal trains.

UNIT IV **10 hours**

Railway Station and Yards Site selection, facilities, classification, platforms, building areas, types of yards, catch sidings, ship sidings, foot over bridges,

subways, cranes, weigh bridge, loading gauge, end loading ramps, locomotive sheds, ash-pits, water columns, turntable, triangles, traverse, carriage washing platforms, buffer stop, scotch block, derailing switch, sand hump, fouling mark. High Speed Railways Modernization of railways, effect of high-speed track, vehicle performance on track, high speed ground transportation system, ballast less track, elevated railways, underground and tube railways.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. *Clifford F. Bonnett, "Practical Railway Engineering", 2nd Edition, Imperial College Press, London, 2005.*
2. *Gupta, B.L. and Amit Gupta, "Railway Engineering", Third Edition, Standard Publishers, New Delhi, India, 2005*
3. *J.S. Mundrey, "Railway Track Engineering", Fourth Edition, Tata McGraw-Hill Education Private Limites, New Delhi, 2010.*

SEMESTER: III

COURSE TITLE: Airport Infrastructure Planning & Design
COURSE CODE: MTE305

L	T	P	Credits
3	0	0	3

Total: 45 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Classify the different components of airport and aircrafts.
2. Analyze the requirements of an airport layout with respect to international regulations.
3. Interpret the airport runway design.
4. Design Taxiways & Aprons.

Course Content

UNIT I **15 hours**

AIR TRANSPORTATION: Airport terminology, component parts of Aeroplan, Classification and size of airports; Aircraft characteristics. Air traffic control need for ATC, Air traffic control network, Air traffic control aids –enroute aids, landing aids. Airport site location and necessary surveys for site section, airport obstructions.

UNIT II **10 hours**

PLANNING: Airport master plan – FAA recommendations, Regional Planning, ICAO recommendations, Estimation of future airport traffic needs- layout of Air Port

RUNWAYS: Runway orientation, basic runway length, corrections for elevation, temperature and gradient, runway geometric design

UNIT III **10 hours**

TAXIWAYS AND APRONS: Loading aprons – holding aprons – Geometric design standards, exit taxiways – optional location, design, and fillet and separation clearance.

UNIT IV **10 hours**

TERMINAL SERVICE FACILITIES: Passenger, baggage and cargo handling systems; Lighting, visual airport marking, airport lighting aids, airport drainage.

OPERATIONS AND SCHEDULING: Ground transportation facilities; Airport capacity, runway capacity and delays.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. *Khanna S.K., Arora M.G., Jain S.S., "Airport Planning & Design", 1 st Edition, Nemchand Bros. Roorkee, 2009.*
2. *2. Robert Horonjeff, Francis McKelvey, William Sproule and Seth Young, "Planning and Design of Airports" 5 th Edition, 2010.*

Course Title: Research Methodology
Course Code: MTE306

L	T	P	Credits
4	0	0	4

Total hours: 60

Course learning outcomes: On successful completion of this course, students will be able to:

1. Identify and comprehend the role and importance of research in the social sciences.
2. Identify and comprehend the issues and concepts salient to the research process.
3. Choose the appropriate research design and develop appropriate research hypothesis for a research project
4. Interpret the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project.

COURSE CONTENT

Unit-I **15 Hours**

Research: its concept, nature, scope, need and Objectives of Research, Research types, Research methodology, Research process – Flow chart, description of various steps, Selection of research problem.

Unit-II **15 Hours**

Research Design: Meaning, Objectives and Strategies of research, different research designs, important experimental designs,

Methods of Data Collection and Presentation: Types of data collection and classification, Observation method, Interview Method, Collection of data through Questionnaires, Schedules, data analysis and interpretation, editing, coding, content analysis and tabulation

Unit-III **15 Hours**

Sampling Methods:

Different methods of Sampling: Probability Sampling methods, Random Sampling, Systematic Sampling, Stratified Sampling, Cluster Sampling and Multistage Sampling. Non probability Sampling methods, Sample size.

Unit-IV **15Hours**

Report writing and Presentation: Types of reports, Report Format – Cover page, Introductory page, Text, Bibliography, Appendices, Typing instructions, Oral Presentation

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

- Panneerselvam, R, 'Research Methodology', PHI, New Delhi.
- Cooper, D.R., Schindler, P.S., 'Business Research Methods,' Tata McGraw Hill
- Gupta S P,' Statistical Methods', Sultan Chand & Sons, Delhi
- Ronald E Walpole, 'Probability and Statistics for Engineers and Scientists' (International Edition), Pearson Education.
- Geode, Millian J. & Paul K. Hatl, "Methods in Research", McGraw Hills, NewDelhi

Suggested Readings:

- Kothari C.R., "Research Methodology", New Age Publisher
- Nargundkar R, Marketing Research, Tata McGraw Hill, New Delhi,2002.
- Sekran, Uma, "Business Research Method", Miley Education, Singapore

Website/Links/Online Portal/ICT

- https://www.academia.edu/
- https://www.studeersnel.nl
- https://www.scribd.com

Course Title: Dissertation Phase-I
Course Code: MTE307

L	T	P	Credits
0	0	8	4

Total hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Create, analyze and critically evaluate different technical/architectural solutions.
2. Analyze the consciousness critically of the ethical aspects of research and development work.
3. Create, analyze and evaluate different technical/architectural solutions.
4. Interpret the capability of critically and systematically integrate knowledge.

Course Content

The dissertation will normally contain:

1. A clear indication, at appropriate stages, of original and critically elements. The level of originality expected is likely to include the application of existing techniques to new environments, the use of original materials, the re-working of existing materials, and the Use of comparative approaches to the provision of information technology;

2. A discussion of its scope and aims, and its theoretical and professional significance, including discussion of the context in which the problem is seen as important;

3. An analysis of the topic within a critically review of the relevant literature;

4. An evaluation of methods used in the dissertation, their reliability, validity, and a comparison with alternative methods;

5. An account of the process of obtaining the data required for the dissertation and the results obtained;

6. An analysis of the results of the dissertation to include a discussion of their significance, their relationship to other research, and any methodological or theoretical implications;

7. The relationship of the findings to existing professional understanding and, where Appropriate, potential implementation difficulties. It is not intended to restrict students to a precisely defined format for the dissertation but it should follow the standard practices of dissertation writing. Although a written report will normally be expected, it should be accompanied by soft copy on CD.

SEMESTER-IV

Course Title: Dissertation Phase - II
Course Code: MTE402

L	T	P	Credits
0	0	0	20

Total hours:300

Learning Outcomes: After completion of this course, the learner will be able to:

1. Create, analyze and critically evaluate different technical/architectural solutions.
2. Analyze the consciousness critically of the ethical aspects of research and development work.
3. Create analyze and evaluate different technical/architectural solutions.
4. Interpret the capability of critically and systematically integrate knowledge.

Course Content

The dissertation will normally contain:

1. A clear indication, at appropriate stages, of original and critically elements. The level of originality expected is likely to include the application of existing techniques to new environments, the use of original materials, the re-working of existing materials, and the Use of comparative approaches to the provision of information technology;

2. A discussion of its scope and aims, and its theoretical and professional significance, including discussion of the context in which the problem is seen as important;

3. An analysis of the topic within a critically review of the relevant literature;

4. An evaluation of methods used in the dissertation, their reliability, validity, and a comparison with alternative methods;

5. An account of the process of obtaining the data required for the dissertation and the results obtained;

6. An analysis of the results of the dissertation to include a discussion of their significance, their relationship to other research, and any methodological or theoretical implications;

7. The relationship of the findings to existing professional understanding and, where Appropriate, potential implementation difficulties. It is not intended to restrict students to a precisely defined format for the dissertation but it should follow the standard practices of dissertation writing. Although a written report will normally be expected, it should be accompanied by soft copy on CD.