BRILLIANT INSTITUTE OF ENGINEERING AND TECHNOLOGY HYDERABAD
UGC AUTUNOMOUS INSTITUTION
M.TECH IN TRANSPORTATION ENGINEERING
EFFECTIVE FROM ACADEMIC YEAR 2025-26 ADMITTED BATCH
B25 COURSE STRUCTURE AND SYLLABUS

I YEAR I – SEMESTER

S.No	Course Code	Course Title	L	T	P	Credits
1	25QA22101	Urban Transportation Policy & Planning	3	0	0	3
2	25QA22102	Pavement Material Characterization	3	0	0	3
3	PE-I	1. 25QA22103 : Traffic Infrastructure Design & Engineering 2. 25QA22104 : Road Safety Engineering 3. 25QA22105 : Applied Statistics	3	0	0	3
4	PE-II	1. 25QA22106 : Remote Sensing & GIS 2. 25QA22107 : Mass Transportation System Planning &Management 3. 25QA22108 : Airport Engineering	3	0	0	3
5	25QA22109	Highway Material Characterization Laboratory	0	1	2	2
6	25QA22110	Traffic Measurements Laboratory	0	1	2	2
7	25QA00101	Research Methodology and IPR	2	0	0	2
8	25QA00A1	Audit Course-I	2	0	0	0
		Total Credits	**16**	**2**	**4**	**18**

I YEAR II– SEMESTER

S.No	Course Code	Course Title	L	T	P	Credits
1	25QA22201	Pavement Analysis & Design	3	0	0	3
2	25QA22202	Land use & Transportation Modelling	3	0	0	3
3	PE-III	1. 25QA22203 : Highway Project Formulation & Economics 2. 25QA22204 : Environmental Impact Assessment 3. 25QA22205 : Engineering of Ground	3	0	0	3
4	PE-IV	1. 25QA22206 : Intelligent Transportation System 2. 25QA22207 : Traffic Analysis 3. 25QA22208 : Traffic Management & Design	3	0	0	3
5	25QA22209	Pavement Evaluation & Performance Laboratory	0	1	2	2
6	25QA22210	Traffic & Transportation Planning Studio Laboratory	0	1	2	2
7	25QA22211	Mini project with Seminar	0	0	4	2
8	25QA00A2	Audit Course- II	2	0	0	0
		Total Credits	**14**	**2**	**8**	**18**

II YEAR I – SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1.	PE-V	1. 25QA22301 : Disaster Analytics 2. 25QA22302 : Rural Roads 3. 25QA22303 : Pavement Construction Maintenance &Management	3	0	0	3
2.	25QA22304	Open Elective	3	0	0	3
3.	25QA22305	Dissertation Work Review - II	0	0	12	6
4.		**Total Credits**	**6**	**0**	**12**	**12**

II YEAR II – SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1.	25QA22401	Dissertation Work Review - III	0	0	12	6
2.	25QA22402	Dissertation Viva-Voce	0	0	28	14
		Total	**0**	**0**	**40**	**20**

For **Dissertation Work Review – I,** please refer 7.10 in B25 Academic Regulations

Audit Course 1 & 2:-

1. English for Research Paper Writing.
2. Disaster Management.
3. Sanskrit for Technical Knowledge.
4. Value Education.
5. Indian Constitution.
6. Pedagogy Studies.
7. Stress Management by Yoga.
8. Personality Development through Life Enlightenment Skills.

Open Electives offered by department:

1. Green Building Technology
2. Construction Project Management
3. Safety and Construction Practice Regulations

URBAN TRANSPORTATION POLICY AND PLANNING

M.Tech. I Year I-Sem (Transportation Engineering)

L	T	P	C
3	0	0	3

Prerequisites:- Nil

Objectives:

- The course introduces students to the fundamentals of Urban transportation planning.
- It familiarizes students with contemporary transportation planning issues and methods of analysis.
- Relationships between transportation and urban land use systems and new tools to address environmental and quality of life impacts of transportation are presented.

UNIT - I

Introduction: Role of transportation in the Economic development of Nations, Overview of transport modes, growth trends, National Transport Policy of India – Case studies, Transportation planning in the developing world; and comparative International transportation policies; Fundamentals of transportation , Principles of planning, evaluation, selection, adoption, financing, and implementation of alternative urban transportation systems; formulation of community goals and objectives, inventory of existing conditions; transportation modeling trip generation, distribution, modal choice, assignment

UNIT - II

Data Collection And Inventories: Collection of data – Organization of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

UNIT - III

Travel Demand issues: Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Detailed approach on 4 step travel demand estimation; Sequential and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

UNIT - IV

Demand and Supply planning : Planning for sustainable urban mobility, positive and negative externalities in urban transport, congestion pricing, parking policy, demand management ,Urban travel and transportation system characteristics - a systems perspective, Data management and use in decision making , Demand analysis , Urban activity analysis, Supply analysis; Plan Preparation And Evaluation: Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis.

UNIT - V

Metropolitan Cities: Design issues in urban mobility, integrating land use and transport planning; Overview of urbanization process, city structure and urban activity and infrastructure systems,

Economic and social significance of urban infrastructure systems; Transport's Role in tackling Social Inclusion, Economic Impacts of Transport Policy.

Course Outcomes:

At the end of the course, the student will be able to:

- Identify Urban transportation problems and understand the principles of planning.
- Organize and conduct various types of surveys
- Apply travel demand estimation techniques
- Plan sustainable urban mobility and evaluate alternate improvements.
- Identify design issues in metropolitan cities.

Reference Books:

1. Introduction to Transportation Planning – M.J.Bruton; Hutchinson of London Ltd.
2. Introduction to Urban System Planning - B.G.Hutchinson; Mc Graw Hill.
3. Traffic Engineering and Transport Planning - Kadiyali L.R., Khanna Publishers
4. Lecture notes on UTP - Prof. S. Raghavachari , R.E.C.Warangal.
5. Metropolitan transportation planning – John W. Dickey, Tata Mc Graw Hill, New Delhi, 1975.

PAVEMENT MATERIAL CHARACTERIZATION

M.Tech. I Year I-Sem (Transportation Engineering)	L	T	P	C
	3	0	0	3

Pre-requisites:- Nil

Objectives:

- The main objective of this course is to provide students with a thorough understanding of the pavement material and its characterization.
- The focus will be on practices of pavement material design of highway agencies.

UNIT - I

Subgrade Soil Characterization: Properties of subgrade layers; different types of soils, Mechanical response of soil; SPT, DCPT, CPT, CBR, Plate Load test & resilient modulus; Field compaction and control. Dynamic properties of soil: FWD test. Introduction to Ground improvement techniques; Introduction to Geo textiles and geo synthetics applications.

UNIT - II

Aggregate Characterization: Origin, Classification, Types of aggregates; Sampling of aggregates; Mechanical and shape properties of aggregates, Aggregate texture and skid resistance, polishing of aggregates; Proportioning and Blending of aggregates: Super pave gradation**,** Fuller and Thompson's Equation, 0.45 power maximum density graph; Use of locally available materials in lieu of aggregates.

UNIT - III

Bitumen: Bitumen sources and manufacturing, Chemistry of bitumen, Bitumen structure, Basic properties of bitumen, rheological properties of bitumen, Superpave specifications for bituminous binder including aging protocols like RTFOT, PAV; Bending Beam Rheometer test, Dynamic Shear Rheometer; Bitumen emulsions: SS, MS and RS types with applications; Characterisation of bitumen emulsions; modified bituminous binders like CRMB, PMB, NRMB and their application for the highways

UNIT - IV

Bituminous Concrete Mix Characterization: Desirable properties of bituminous mixes, Design of bituminous mixes: Modified Marshall's specifications, Introduction to super pave mix design procedure Desirable properties of bituminous mixes, design of bituminous mixes: Marshall's Mix Design (as per MS 2 Manual), Superpave Mix Design as per Superpave series 2; Indirect tensile strength, Tensile strength ratio; Performance Tests on Bituminous Mixes: Rutting Tests, Fatigue Tests, Dynamic Modulus Tests, moisture resistance tests and the microstructural investigations; Special Mixes and alternative materials like Stone Matrix Asphalt, Porous Asphalt, Warm Mix Asphalt, Half Warm Mix Asphalt and RAP based mixes

UNIT - V

Cement and Cement Concrete Mix Characterization: Types of cements and basic cement properties, mineral admixtures like fly ash, GGBS, other pozzolonic materials Quality tests on cement; Introduction to advanced concretes porous concrete, fiber reinforced concrete, block pavement Light weight concrete, Roller Compacted Concrete for pavement application; white topping, Nano technology applications in cement concrete.

Course Outcomes:

At the end of the course, students will be able to

- Determine the properties subgrade layers
- Characterize the pavement materials including soil, aggregates, bitumen and cement
- Understand the properties of Bitumen
- Understand the desirable properties of the bituminous mixes.
- Understand the properties of cement and Pavement Quality Concrete.

Reference Books:

1. Atkins, N. Harold, Highway Materials, Soils and Concretes, Fourth Edition, 2002, Prentice-Hall.
2: Kerbs Robert D. and Richard D. Walker, Highway Materials, McGraw-Hill, 1971.
3. Relevant IRC and IS Codes of Practices (Separate List will be given).
4. The Shell Bitumen Handbook, by Robert Hunter, Andy Self and John Read, Sixth Edition, Shell Bitumen by ICE Publishing, London, 2015.
5. Bituminous Road Construction in India, by Prithvi Signh Kandhal PHI, 2016
6. Advances in Asphalt materials – Road and Pavement construction by Shin Che Huang and Herve Di Benedetto, Woodhouse Publishing, 2015
7. Properties of Concrete by A.M. Neville, 5th Edition, Pearson Publications, 2012
8. Highway Material Testing Laboratory Manual by Khanna S. K., Justo, C.E.G and Veeraragavan, A., Nem Chand & Bros.
9. Relevant IRC and IS codes

TRAFFIC INFRASTRUCTURE DESIGN & ENGINEERING
(Professional Elective- I)

M.Tech. I Year I-Sem (Transportation Engineering) **L T P C**
3 0 0 3

Prerequisites:- Nil

Objectives:

- Students will develop a good command of the concepts involved in geometric design of intersections, horizontal & vertical alignment of roads & pedestrian facilities.
- Describe the urban street hierarchy and functional classification system.
- Identify and define the elements of a roadway cross-section. Discuss concepts related to the roadway design speed.
- Discuss alignment and grade elements including sight distance; horizontal and vertical curves; terrain and acceptance grades for urban local and collector streets.
- Define the functional area of an intersection. Identify key design elements for intersections.

UNIT - I

Functional Classification of Highway System; Design Controls – Topography, Driver characteristics, Vehicle Characteristics, Traffic, Capacity and Level of Service, Design Speed. Objectives of Geometric Design, Cross Section Elements: Design specifications; Pavement Surface characteristics – Skid Resistance, Road Roughness; Camber, Objectives, design standards. Specifications for hill roads.

UNIT - II

Horizontal Alignment of Roads: Sight Distances – Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance ; Objectives of horizontal curves; Super elevation; Extra-widening on Curves; Transition Curves – Objectives and Design. Transition Curve setting methods.

UNIT - III

Vertical Alignment of Roads: Gradients – Types of Gradients, Design Standards; Vertical Curves – Summit Curves, Valley Curves and Design criteria for Vertical Curves; Importance of Sight Distances for Horizontal and Vertical Curves ; Combination of Vertical and Horizontal Curves – Grade Compensation

UNIT - IV

Geometric Design of Intersections : Types of Intersections; Design Principles for Intersections; Design of At-grade Intersections – Channelization, Objectives; Traffic Islands and Design standards; Rotary Intersection – Concept, Advantages and Disadvantages; Grade separated Interchanges – Types, warrants and Design standards, Traffic Signs and Markings

UNIT - V

Traffic Signals –Types of Signals; Principles of Phasing; Timing Diagram; Design of Isolated Traffic

Signal by Webster method, Warrants for signalization. Signal Coordination - Signal Co-ordination methods, Simultaneous, Alternate, Simple progression and Flexible progression Systems.
Pedestrian facilities on Urban Roads; Cycle Tracks – Guidelines and Design standards; Bus bays – Types and Guide lines; Design of On-street and Off street Parking facilities – Parking indices, Road user & Environment – Engineering Enforcement Education for prevention of Accidents.

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

- Describe the functional classification of highway system.
- Describe the importance of sight distance and design horizontal alignment of roads.
- Understand the concepts of vertical alignment and grade compensation.
- Design the intersections, interchanges, and parking facilities.
- Design traffic signals and pedestrian facilities.

Reference Books:

1. Principles and Practice of Highway Engineering, L.R.Kadiyali and N.B.Lal, Khanna, 2007.
2. Traffic Engineering and Transportation Planning, L.R.Kadiyali, Khanna Publications, 2007.
3. Principles of Highways Engineering and Traffic Analysis - Fred Mannering & Walter Kilareski, John Wiley & Sons Publication.
4. IRC Codes for Signs, Markings and Mixed Traffic Control in Urban Areas.
5. Fundamentals of Transportation Engineering - C.S.Papacostas, Prentice Hall India.
6. Traffic Engineering - Theory & Practice - Louis J.Pignataro, Prentice Hall Publication.
7. Transportation Engineering - An Introduction - C.Jotin Khisty, Prentice Hall Publication.
8. I.T.E. Traffic Engineering Hand Book.

ROAD SAFETY ENGINEERING
(Professional Elective-I)

M.Tech. I Year I-Sem (Transportation Engineering) **L T P C**
3 0 0 3

Prerequisites:- Nil

Objectives:

- This course discusses the fundamentals of traffic engineering & some of the statistical methods to analyze the traffic safety.
- The accident investigation and risk involved with measures to identify the causes are dealt.
- The various traffic management systems for safety & safety improvement strategies are dealt.

UNIT - I

Fundamentals of Traffic Engineering - Basic Characteristics of Motor-Vehicle Traffic, Highway Capacity, Applications of Traffic Control Devices, Traffic Design of Parking Facilities, Traffic Engineering Studies; Statistical Methods in Traffic Safety Analysis – Regression Methods, Poisson Distribution, Chi- Squared Distribution, Statistical Comparisons.

UNIT - II

Accident Investigations and Risk Management: Collection and Analysis of Accident Data, Condition and Collision Diagram, Causes and Remedies, Traffic Management Measures and Their Influence on Accident Prevention, Assessment of Road Safety, Methods to Identify and Prioritize Hazardous Locations and Elements, Determine Possible Causes of Crashes, Crash Reduction Capabilities and Countermeasures, Effectiveness of Safety Design Features, Accident Reconstruction.

UNIT - III

Road Safety in Planning And Geometric Design: Vehicle And Human Characteristics, Road Design and Road Equipments, Redesigning Junctions, Cross Section Improvements, Reconstruction and Rehabilitation of Roads, Road Maintenance, Traffic Control, Vehicle Design and Protective Devices, Post Accident Care.

UNIT - IV

Role of Urban infrastructure design in safety: Geometric Design of Roads; Design of Horizontal and Vertical Elements, Junctions, At Grade and Grade Separated Intersections, Road Safety in Urban Transport, Sustainable Modes and their Safety.

UNIT - V

Traffic Management Systems for Safety: Road Safety Audits and Tools for Safety Management Systems, Road Safety Audit Process, Approach to Safety, Road Safety Improvement Strategies, ITS and Safety.

Course Outcomes:

At the end of the course, the students will be able

- To understand fundamentals of traffic engineering.
- To investigate & determine the collective factors & remedies of accidents involved.
- To design & plan road geometrics to improve safety.
- Understand role of urban infrastructure design in safety.
- To conduct road safety audits.

References Books:

1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers
2. Fundamentals of Transportation Engineering - C.S.Papacostas, Prentice Hall India.
3. Transportation Engineering – An Introduction, C.Jotin khisty, B. Kent Lall
4. Fundamentals of Traffic Engineering, Richardo G Sigua
5. Handbook of Road Safety measures, second Edition, Rune Elvik, Alena Hoye, Truls Vaa, Michael Sorenson
6. Road Safety by NCHRP

APPLIED STATISTICS
(Professional Elective-I)

M.Tech. I Year I-Sem (Transportation Engineering)

L	T	P	C
3	0	0	3

Prerequisites:- NIL

Objectives:

The students of Transportation Engineering will acquire knowledge to

- Understand the qualitative and quantitative study of the frequency distributions
- Identify the scientific methods of sampling and fitting the suitable distribution to the available data
- Learn the basic concepts of Probability theory
- Apply the concept of probability in testing the Hypothesis to accept or reject at a given level of significance
- Learn the methods for analyzing multivariate data by finding the relationship between the variables both qualitatively(Correlation) and quantitatively(Regression)

UNIT - I

Introduction to Sampling Techniques and Statistical Distributions: Frequency distribution; Mean; Standard deviation; Standard error, Skewness; Kurtosis; Definitions and Applications; Simple random sampling; Stratified sampling; Systematic sampling; Sample Size determination; Applications in Traffic Engineering ; Statistical Distributions: Binomial, Poisson, Exponential and Normal distributions; Fitting of distributions; Mean and variance; Chi-square test of goodness-of-fit; Chi-square distribution; Students T-distribution; Snedectors, F- Distribution. Applications in Traffic Engineering.

UNIT - II

Probability: Laws of Probability; Conditional probability and Independent events; Laws of expectation. Theorem of total probability and Baye's theorem

UNIT - III

Regression and Correlation: Linear regression and correlation; Multiple correlation; Multiple correlation coefficient; Standard error of estimate; Curvilinear regression models; Applications in Transportation Engineering.

UNIT - VI

Multivariate data analysis: Types of data; Basic vectors and matrices, Dispersion, Variance and covariance, Analysis of Variance; Correlation matrices; Principal component analysis, Time series analysis.

UNIT - V

Tests of Significance & Confidence Interval: Large sample and small sample tests; Tests for single mean, Means of two samples, Proportions, two variances, two observed correlation coefficients,

Applications. Intervals for mean, variance and regression coefficients; Applications in Traffic Engineering problems.

Course outcomes:-

At the end of the course, the students will be able to.

- Understand the various sampling techniques and statistical distributions.
- Understand the Laws of Probability
- Understand the Regression and Correlation techniques
- Understand the Multivariate data analysis
- Understand the Tests of Significance & Confidence Interval

References Books:

1. Basic Statistics - Simpson and Kafks; Oxford and IBH Calcutta, 1969.
2. Fundamentals of Mathematical Statistics – Gupta, S.C and Kapoor, K.V.Sultanchand.
   Multivariate Data Analysis –Cootey W.W & Cohens P.R;John Wiley &Sons.

REMOTE SENSING & GIS
(Professional Elective-II)

M.Tech I Year I-Sem (Transportation Engineering)

L	T	P	C
3	0	0	3

Prerequisites:- Nil

Objectives:
This course will focus on introducing students to the use of Geographic Information Systems in the urban environment for transportation engineering.

Students successfully completing this course should be able to:
- Understand the purposes of GIS and the kinds of problems to which GIS is applied.
- Understand the fundamental types of GIS data, including raster and vector data.
- Use GIS operators to perform a number of kinds of analysis.
- Be prepared to use GIS to support personal and professional decision making.
- Understand the limitations of Geographic Information systems and of geographic data in general.

UNIT - I:
Remote Sensing: Basic Principles – Introduction, Electromagnetic and its properties, interaction with Earth surface materials, recent developments in Remote sensing, Social and legal implications of Remote sensing, status of Remote sensing, Characteristics of Imaging remote sensing instruments, satellite remote sensing system – a brief over view, other remote sensing satellites.

UNIT - II:
Pre-Processing of Remotely Sensed Data: Introduction, cosmetic operation; Geometric correction and registration, atmospheric correction. Image Transforms: Introduction, arithmetic operations, empirically based image transforms, principal component analysis, multiple discriminant analysis etc.

UNIT - III:
GIS introduction data processing, Analysis and Modeling : Raster based GIS data processing – vector based GIS data processing – Queries – Spatial analysis – Descriptive statistics – Spatial autocorrelation – Quadrant counts and nearest neighbor analysis – Network analysis – surface modeling – DTM; Data Management : The data base designs and approaches, 3 classic data models, nature of geographic data, spatial data models, Databases for GIS; Definitions of GIS – Components of GIS – Geographic data presentation : maps – mapping process – Coordinate systems – Transformations- map projections – geo referencing – data acquisition.

UNIT - IV
Application of GIS in Transportation Engineering – I : Intelligent information system for road accessibility study, GIS data base design for physical facility planning, Decision support systems for land use planning.

UNIT - V

Application of GIS in Transportation Engineering – II : GIS applications in environment impact assessment and environment monitoring, GIS based Highway alignment, GIS based road network planning, GIS based traffic congestion analysis and accident investigation, Utility management.

Course outcomes:

At the end of the course, students will be able to

- Describe the Basic Principles of Remote Sensing.
- Understand the concepts of Pre-Processing of Remotely Sensed Data and its applications.
- Understand the data processing, Analysis and Modeling techniques.
- Apply GIS for various transportation issues.
- Apply GIS in environment impact assessment.

References Books :

1. Lo, C.P. & Yeung A.K.W., Concepts and Techniques of Geographic Information Systems, Prentice Hall of India, New Delhi, 2002.
2. Burrough, P.A., Principles of Geographical Information Systems, Oxford Publication, 1998.
3. Clarke, K., Getting Started with Geographic Information Systems, Prentice Hall, New Jersy, 2001.
4. DeMers, M.N., Foundamentals of Geographic Information Systems, John Wiley & Sons, New York, 2000.
5. Geo Information Systems – Applications of GIS and Related Spatial Information Technolgoes, ASTER Publication Co., Chestern (England), 1992.
6. Jeffrey, S. & John E., Geographical Information System – An Introduction Prentice – Hall, 1990.
7. Marble, D.F., Galkhs HW & Pequest, Basic Readings in Geographic Information Systems, Sped System Ltd., New York, 1984.
8. GIS for Urban & Regional Planning, Scholten & Stillwen 1990, Kulwer Academie
9. GIS A management, Perspenfi Stan Aronoff, WDL Publisher
10. GIS By Stonffer

MASS TRANSPORTATION SYSTEM PLANNING & MANAGEMENT
(Professional Elective-II)

M.Tech. I Year I-Sem (Transportation Engineering)

L	T	P	C
3	0	0	3

Prerequisites: - Nil

Objectives:

- To understand the transit system, its characteristics and evaluate its performance.
- To estimate transit demand and plan bus route networks.
- To study concepts of bus scheduling and evaluation methods.
- Identify Mass transit corridors, evaluate the various systems and plan transit marketing.

UNIT - I

Transit System: Role of Transit - Types of Transit Modes - Buses - LRT, RTS - Air cushioned and Maglev System – S- Bahn Dual Mode Busses, Para Transit - Dial - a- Ride-Taxi- Jitney and Ridesharing – PRT Networks -DRTS ; System Characteristics: Technological Characteristics – Resistances, acceleration & velocity Profiles – Operational characteristics speed, capacity & payloads – Route capacity – Comfort conditions - Performance relationships - Public and Private Operations - Modes for Intercity Transport.

UNIT - II

Estimation Of Transit Demand: Data requirements & Collection techniques, Conventional Methods - Destination Survey - Bus Stop Surveys and Analysis - Mode Split Models - Captive and Choice Riders - Attitudes of Travelers - Patronage Determination.

UNIT - III

Bus Route Network Planning: Route Systems - Route Location, Route Structure, Route Coding Techniques, Route Capacity - Planning of Transit Network - Different Types - Service Area Coverage - Evaluation - Selection of Optimal Network - Path Building Criteria - Integration with UTPS. Scheduling: Patterns of Bus Services - Frequency of Services - Special Services - Single Route Bus Scheduling - Fleet Requirement, Marginal Ridership Concept - Use of Optimization Technique - Load Factor - Depot Location - Spacing of Bus Stops; Bus Stops And Terminal Designs: Bus stop capacities – Bus Parking patterns at Terminals and Wayside Stations – Integration.

UNIT - IV

Mass Transit Corridor Identification & Planning: Corridor identification - Network Compression Method - Planning of Rapid Transit System - System Selection - Supporting and Enclosing Structures - System Evaluation - Track Structures - Power Supply and Distribution - Signal System - Aesthetics and Noise Consideration - Cost of Construction - Station Arrangements - Platform Capacity - Fare Collection, Transit Marketing.

UNIT - V

Mass Transport Management Measures: Performance Indicators –- Preferential Treatment to HOV: Exclusive Bus Lanes - Bus Streets - Contra Flows - Reversible Lanes - Bus Bypass - Bus Pre-emption at Signals.

Course Outcomes:

At the end of the course, students will be able to

- Understand the concepts of transit system and its operation.
- Estimate transit demand.
- Understand the concepts of bus route network planning and patterns.
- Understand the concepts of Mass transit corridor identification.
- Identify and evaluate Mass Transit corridors efficiently.

Reference Books:

1. A. Black, Urban Mass Transport Planning, McGraw Hill.
2. V.R. Vuchic, Urban Public Transport System and Technology, Prentice Hall Inc.
3. G.E. Gray and CA Hoel: Public Transport Planning Operation and Management, Prentice Hall.
4. White PR, Planning for Public Transport, UCL Press Ltd.

AIRPORT ENGINEERING
(Professional Elective-II)

M.Tech. I Year I-Sem (Transportation Engineering)

L	T	P	C
3	0	0	3

Prerequisites:- Nil

Objectives:

- The module introduces the Airport planning issues along with the designing of Runway.
- The visual aids required from Airport Traffic operating are dealt with the necessary inputs required for efficient drainage system has significance in maintenance the airport.

UNIT - I

Airport Planning: General- Regional Planning- Development of New Airport- Data Required before Site Selection- Airport Site Selection- Surveys for Site Selection- Drawings to be prepared- Estimation of Future Air Traffic Needs.

UNIT - II

Runway Design: Runway Orientation- Basic Runway Length- Corrections for Elevation, Temperature and Gradient- Airport Classification- Runway Geometric Design- Airport Capacity- Runway Configurations- Runway Intersection Design.

UNIT - III

Structural Design Of Airport Pavements: Introduction- Various Design Factors- Design Methods for Flexible Pavement- Design Methods for Rigid Pavement- LCN System of Pavement Design- Joints in Cement Concrete Pavement- Airport Pavement Overlays- Design of an Overlay.

UNIT- IV

Visual Aids: General- Airport Marking- Airport Lighting.

UNIT - V

Airport Grading And Drainage: General- Computation of Earthwork- Airport Drainage- Special Characteristics and Requirements of Airport Drainage- Design Data- Surface Drainage Design- Subsurface Drainage Design.

Course Outcomes:

At the end of the course, the student will be able to:

- Understand the regional planning concepts for an airport.
- Design the runway length after considering the correction required for basic runway length.
- Understand the Structural Design Of Airport Pavements.
- Understand the visual aids required for safe landing and takeoff operation of airport.
- Analyze and design the Airport drainage.

Reference Books:-

1. Airport Planning And Designing by S.K. Khanna, M.G. Arora.
2. Highway Engineering including Expressways and Airport Engineering by Dr.L.R. Kadyali, Dr.N.B. Lal.
3. Highway Engineering including Airport Pavements by Dr.S.K. Sharma.
4. Transportation Engineering by S.P.Chandola.

HIGHWAY MATERIAL CHARACTERIZATION LABORATORY

M.Tech. I Year I-Sem (Transportation Engineering)

L	T	P	C
0	1	2	2

Prerequisites:- Nil

Objectives:

The students will acquire knowledge about

- Objective material characterization of aggregates.
- Fundamental tests on Bitumen.

(A) Aggregate Characteristics

1. Crushing Strength
2. Impact test
3. Shape tests

   Sieve analysis on Fine & Coarse aggregate (Gradation for different Layers in highway)
4. Los Angeles Abrasion Test
5. Specific gravity & Water absorption Test

(B) Bitumen

6. Penetration test
7. Softening point test
8. Ductility test
9. Flash & Fire point test
10. Specific gravity test
11. Viscosity Test
12. Marshall Stability Mix Design
13. 10 minute boiling test to find the stripping tendency of the bituminous concrete
14. Spot test of bitumen

Course Outcomes:

At the end of the course, the students will be able to:

- Characterize the pavement materials.
- Perform quality control tests on pavements and pavement materials.
- Conduct tests on Aggregates & bitumen.

References Books:

1. Highway Engineering – S.K. Khanna & C.E.G. Justo & A.Veeraragavan. New Chand & Brothers.
2. Highway material Testing - S.K. Khanna & C.E.G. Justo & A.Veeraragavan
3. IRC: SP: 19; 2001, Manual For Survey, Investigation & Preparation of Road Projects.

TRAFFIC MEASUREMENTS LABORATORY

M.Tech. I Year I-Sem (Transportation Engineering)

L	T	P	C
0	1	2	2

Prerequisites:- Nil

Objectives:

The students will acquire knowledge about

- Analyzing characteristics of traffic.
- Various parameters related to delay, speeds and headways.

Traffic Characteristics Survey:-

1. Classified Volume counts at midblock
2. Spot Speeds
3. Gap Acceptance
4. Headway Studies -space & time mean
5. Delay studies
6. Volume-capacity-Competency for different highways LOS Indian HC Manual
7. Lane discipline and its impact
8. Vehicle- Road-Median-clave impact analysis
9. Turning movement surveys at intersections
10. Light intensity using lux meter
11. Sound intensity using decibel meter
12. Air Pollution studies

Course Outcomes:

At the end of the course, the students will be able to:

- Gain Knowledge about various traffic surveys.
- Analyze traffic parameters for various studies.

RESEARCH METHODOLOGY & IPR

M.Tech. I yr I Sem (Transportation Engineering)

L	T	P	C
2	0	0	2

Course Objectives:

- To understand the research problem
- To know the literature studies, plagiarism and ethics
- To get the knowledge about technical writing
- To analyze the nature of intellectual property rights and new developments
- To know the patent rights

UNIT – I

Meaning of research problem, Sources of research problem, Criteria ,Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT - II

Effective literature studies approaches, analysis Plagiarism, Research ethics,

UNIT - III

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT - IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT - V

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case
Studies, IPR and IITs.

Course Outcomes:

At the end of this course, students will be able to

- Understand research problem formulation.
- Analyze research related information and follow research ethics.

- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understand that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property.
- Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

References Books:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for
2. science & engineering students'"
3. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
4. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
5. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
6. Mayall , "Industrial Design", McGraw Hill, 1992.
7. Niebel , "Product Design", McGraw Hill, 1974.
8. Asimov , "Introduction to Design", Prentice Hall, 1962.
9. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New
10. Technological Age", 2016.
11. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

PAVEMENT ANALYSIS AND DESIGN

M.Tech. I Year II-Sem (Transportation Engineering)

L	T	P	C
3	0	0	3

Prerequisites: - Nil

Objectives:

- Engineering analysis of stresses and strains in typical highway pavement structures due to loading from traffic and climate;
- Characterization of paving materials; structural pavement design by IRC, and AASHTO for flexible and rigid pavement are discussed.
- Overlay design for Flexible and Rigid pavement is discussed.

UNIT-I

Factors Affecting Pavement Design: Factors Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT-II

Stresses In flexible Pavement: Tire-Pavement Interaction: Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements; Stress In Flexible Pavements: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts.

UNIT-III

Stresses in Rigid Pavements: Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, and Stresses in Dowel Bars & Tie Bars.

UNIT-IV

Design of Flexible Pavements: Factors affecting flexible pavement Design. IRC 37 guidelines for Flexible Pavement design. MEPDG specifications for flexible pavement design, Overlay design using Benkelmen beam and FWD studies using relevant IRC codes of practices

UNIT-V

Design of Rigid Pavements: Factors effecting rigid pavement design, IRC and MEPDG design guidelines for JPCC rigid pavement design, Continuously reinforced cement concrete pavement design, Overlay design for CC pavements.

Course Outcomes:

At the end of the course, the students will be able to:

- Identify the factors affecting pavement design and their importance.
- Analyze the stresses and strains in a flexible pavement using multi-layered elastic theory.
- Analyze stresses and strains in a rigid pavement using Westergaard's theory.
- Design a Flexible pavement using IRC, Asphalt Institute, and AASHTO methods.
- Design a Rigid pavement using IRC, and AASHTO methods.

References:

1. Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications.
2. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers.
3. Principles of Pavement Design, Yoder.J. & Witzorac Mathew, W. John Wiley & Sons Inc.
4. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc.
5. Pavement and Surfacing for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
6. IRC: 37 & 58 Codes for Flexible and Rigid Pavements Design.& FWD codes of practice

LAND USE & TRANSPORTATION MODELLING

M.Tech. I Year II-Sem (Transportation Engineering)

L	T	P	C
3	0	0	3

Prerequisites: - Nil

Objectives:

- This course covers the fundamentals of land use theory
- Various land use and travel demand models are discussed
- Concepts of network planning and advanced spatial analysis are discussed

UNIT - I

Land Use and Transportation Engineering: Transportation modeling in Planning; Models and their role, Characteristics of Transport demand and supply, Equilibrium of supply and demand, Modeling and decision making, Issues in Transportation modeling and structure of the classic transport model.

UNIT- II

Land Use Transportation and Activity Models: Introduction to Land Use Planning; Relation between Transportation and Land Use Planning; The economic base mechanism and allocation mechanism; Spatial allocation and employment interrelationship; Garin Lowry models.; Activity modeling.

UNIT - III

General Travel Demand Models and Regional Transport Models: Aggregate, Disaggregate models ; Behavioral models; Recursive and direct demand Models; Linear, Non-Linear models; Logit, discriminant and Probit models; Mode split models - Abstract mode and mode specific models. Regional Transport Models: Factors affecting goods and passenger traffic; Prediction of traffic; Growth factor models; Time function iteration models; internal volume forecasting models.

UNIT - IV

Regional Network Planning: Problems in Developing Countries, Network Characteristics - Circuitry, Connectivity, Mobility, Accessibility and Level of Service Concepts - Network Structures and Indices – Network Planning – Evaluation - Graph Theory – Cut sets – Flows & Traversing – Optimum Network - Inter-modal Co-ordination. – Rural Road Network Planning.; User equilibrium concepts.

UNIT - V

Advanced Spatial analysis Modelling: Applications of Artificial Neural networks, Cellular automata, Fuzzy logic systems, Genetic algorithms, artificial intelligence concepts to transportation Modelling.

Course Outcomes:

At the end of the course, the students will be able to

- Understand the fundamentals of land use theory.
- Apply land use and activity models.
- Apply travel demand models & regional transport model
- Identify problems regional networks in developing countries
- Apply spatial analysis modeling.

Reference Books:-

1. Modelling Transport by Jhan De Dios Ortuzar. Luis E.Willumsen. John Wiley& Sons. 1970/1975.
2. Urban Development Models - Ed. By R.Baxter, M.Echenique and J.Owers; The Institute of Transportation Engineering, University of California.
3. Economic Models and Economic Forecast - Robert S, Pindyek, Daniel L.Rubin Field; McGraw Hill.
4. Land Use Transportation Planning Notes - S.R.Chari, REC Warangal.
5. Regional and Urban Models- A.G.Wilson; Pion, London.
6. Urban Modeling - Michael Batty.
7. Behavioral Travel Demand Models - Peter R. Stopher ARNIM.H.MEYBURG.
8. Introduction to Transportation Engineering and Planning, Morlok EK, McGraw Hill

HIGHWAY PROJECT FORMULATION AND ECONOMICS
(Professional Elective- III)

M.Tech. I Year II-Sem (Transportation Engineering)

L	T	P	C
3	0	0	3

Prerequisites: - Nil

Objectives:
The student needs to
- Understand the need & scope of project formulation.
- Learn evaluation of economics of highway projects.
- Understand the concepts of economic analysis and shadow pricing.
- Learn to deal with project analysis and environmental impact assessment.

UNIT - I
Project Formulation: Project Preparation – Flow Chart for Project preparation. Project Cycle-Project Formulation – Need and Scope of Project Formulation – Various Aspects and Approaches in Project Formulation. Stages in Project Formulation. Preparation of Feasibility Report and DPR – Guidelines.

UNIT - II
Economic Evaluation : Need for Economic Evaluation; Stages involved in Economic Analysis; Cost and Benefit components; Discounting Criteria; Welfare economics; Social costs; Rate of Return; Road User Cost study in India ; Value of Travel time Savings – Economic concept of evaluation of travel time savings; Issues connected with evaluation of travel time savings. Vehicle operating costs – Components of VOC, Accident costs; Methodologies for economic evaluation of an accident.

UNIT - III
Economic Analysis; Basic Concepts of Economic Analysis, Principles of Economic Analysis; Cash flow diagrams; Time value of Money; Development of cash flow Diagrams; Methods of Economic Evaluation –Equivalent Uniform Annual Cost Method; Present worth of cost method;- Equivalent uniform annual net return method; Net present value method; Benefit cost ratio method; Rate of Return Method. Applications of these methods to highway projects.

UNIT - IV
Project appraisal by shadow pricing with case studies; Toll system analysis, Financial analysis; Budgeting.

UNIT - V
Environmental impact assessment: Basic Concepts, Objectives, Transportation Related Environmental Impacts – Vehicular Impacts – Safety and Capacity Impacts – Roadway Impacts –

Construction Impacts, Environmental Impact Assessment – Environmental Impact Statement, Environment Audit, Typical case studies.

Course Outcomes:

At the end of the course, the students will be able to

- Prepare feasibility report & DPR.
- Understand the need for project evaluation & stages involved.
- Develop cash flow diagrams.
- Analyze toll system & financial budgeting.
- Demonstrate the need for Environmental impact assessment.

Reference Books:

1. Transportation Engineering Economics – Heggie. I. G.; Mc Graw Hill Publishers.
2. Economic Analysis for Highways – Winfrey.R; International TextBook Company.
3. Traffic Engineering and Transport Planning – L.R Kadiyali, Khanna Publishers.
4. Road User Cost Study, CRRI
5. Road Project Appraisal, for Developing Countries, J.W.Dickey ,John Wiley & Sons.
6. IRC: SP: 19; 2001, Manual For Survey, Investigation & Preparation of Road Projects.
7. IRC: SP: 30, Manual on Economic Evaluation of Highway Projects in India.

ENVIRONMENTAL IMPACT ASSESSMENT
(Professional Elective- III)

M.Tech. I Year II-Sem (Transportation Engineering)

L	T	P	C
3	0	0	3

Prerequisites:- Nil

Objectives:

The students will be able to

- The basic concepts of EIA and its methodologies.
- Impact and assessment of activity on environment.
- Understand environmental audit and legislations.

UNIT - I

Basic concept of EIA and Methodologies: Initial environmental Examination, Elements of EIA, - factors affecting E I A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters. E I A Methodologies: Introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/Benefit Analysis

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UNIT - II

Impact of Developmental Activities and Land use: Introduction, Methodology for the assessment of soil and ground water, Delineation of study area, Identification of activities.

UNIT - III

Procurement of relevant soil: Quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, generalized approach for assessment of Air pollution Impact.

UNIT - IV

Assessment of Impact of development Activities: on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

UNIT - V

Environmental Audit & Environmental legislation: objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, on-site activities, evaluation of Audit data and preparation of Audit report. Post Audit activities **:** The Environmental pollution Act, The water ;Act, The Air (Prevention & Control of pollution Act.), Mota Act. Wild life Act. Case studies and preparation: of Environmental Impact assessment statement for various Industries.

Course outcomes:

The student will be able to

- Understand EIA and its methodologies.
- Assess the impact of development on ground water and soil.
- Assess the impact of development on surface water, air and biological environment.
- Assess the impact of development on vegetation and wild life.
- Understand the objectives of Environmental audit.

Reference Books:

1. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K., Katania &. Sons Publication., New Delhi
2. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd, Delhi.
3. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, Hyderabad.
4. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers

ENGINEERING OF GROUND
(Professional Elective- 3)

M.Tech. I Year II-Sem (Transportation Engineering) **L T P C**
3 0 0 3

Prerequisites:- Nil

Objectives:

- This course will provide a introduction to the design and philosophy of geotechnical site investigations and a legislation element incorporating contaminated land.
- Students will learn about the range of exploration and testing techniques available to geotechnical engineers.
- Students will also learn how investigations are planned and how the results of investigations relate to the design process.

UNIT - I

Introduction to Engineering Ground Modification: Need and objectives, Identification of soil types, in situ and laboratory tests to characterize problematic soils; Mechanical, Hydraulic, Physio-chemical, Electrical, Thermal methods, and their applications.

UNIT - II

Mechanical Modification – Deep Compaction Techniques- Blasting Vibrocompaction, Dynamic Tamping and Compaction piles.

UNIT - III

Hydraulic Modification – Objectives and techniques, traditional dewatering methods and their choice, Design of dewatering system, Electro-osmosis, Electro-kinetic dewatering.
Filtration, Drainage and Seepage control with Geosynthetics, Preloading and vertical drains,

UNIT - IV

Physical and Chemical Modification – Modification by admixtures, Shotcreting and Guniting Technology, Modification at depth by grouting, Crack Grouting and compaction grouting, Jet grouting, Thermal Modification, Ground freezing.

UNIT - V

Modification by Inclusions and Confinement - Soil reinforcement, reinforcement with strip, and grid reinforced soil. In-situ ground reinforcement, ground anchors, rock bolting and soil nailing.

Text Books

1. Hausmann, M. R. (1990) – Engineering Principles of Ground Modifications, McGraw Hill publications
2. M.P.Moseley and K. Krisch (2006) – Ground Improvement, II Edition, Taylor and Francis.

Course Outcomes:

At the end of the course, the students will be able to

- Identify ground conditions and suggest method of improvement.
- Understand the principles of Mechanical Modification.
- Understand the principles of Hydraulic Modification.
- Understand the principles of Physical and Chemical Modification.
- Understand the concepts of Modification by Inclusions and Confinement.

Reference Books:

1. Koerner, R. M (1994) – Designing with Geosynthetics – Prentice Hall, New Jersey
2. Jones C. J. F. P. (1985) – Earth Reinforcement and soil structures – Butterworths, London.
3. Xianthakos, Abreimson and Bruce - Ground Control and Improvement
4. K. Krisch & F. Krisch (2010) - Ground Improvement by Deep Vibratory Methods, Spon Press, Taylor and Francis
5. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012.

INTELLIGENT TRANSPORTATION SYSTEMS
(Professional Elective- IV)

M.Tech. I Year II-Sem (Transportation Engineering)

L	T	P	C
3	0	0	3

Prerequisites:- Nil

Objectives:
Within the core module students will have been introduced to some of the basic concepts of Intelligent Transport Systems. The detailed objectives are:

- To develop an understanding of various sensor technology of ITS.
- To describe the of ITS architecture and user needs in functional areas of ITS
- Understand the various applications of ITS
- Understand how to evaluate technologies, applications and services of ITS

UNIT - I
Fundamentals of ITS: Definition of ITS, the historical context of ITS from both public policy and market economic perspectives, Types of ITS; Historical Background, Benefits of ITS.

UNIT - II
Sensor technologies and Data requirements of ITS: Importance of telecommunications in the ITS. Information Management, Traffic Management Centers (TMC). Application of sensors to Traffic management; Traffic flow sensor technologies; Transponders and Communication systems; Data fusion at traffic management centers; Sensor plan and specification requirements; Elements of Vehicle Location and Route Navigation and Guidance concepts; ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), GIS, video data collection.

UNIT - III
ITS User Needs and Services and Functional areas – Introduction, 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
ITS Architecture – Regional and Project ITS architecture**;** Concept of operations; ITS Models and Evaluation Methods; Planning and human factor issues for ITS, Case studies on deployment planning and system design and operation; ITS and safety, ITS and security, ITS as a technology deployment program, research, development and business models, ITS planning.

UNIT - V

ITS applications: Traffic and incident management systems; ITS and sustainable mobility, travel demand management, electronic toll collection, ITS and road-pricing.; Transportation network operations; commercial vehicle operations and intermodal freight; public transportation applications; ITS and regional strategic transportation planning, including regional architectures: ITS and changing transportation institutions 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.

Course Outcomes:

At the end of the course, the students will be able to

- Understand the importance of ITS.
- Understand the concepts of application of sensors to Traffic management.
- Select appropriate ITS technology depending upon user Needs and Services.
- Understand the concepts of ITS Architecture.
- Design and implement ITS for Traffic and Incident Management.

Reference Books:

1. Fundamentals of Intelligent Transportation Systems Planning By Mashrur A. Chowdhury, Adel Wadid Sadek
2. Lawrence A. Klein, Sensor Technologies and Data requirements of ITS
3. ITS Hand Book 2000: *Recommendations for World Road Association (PIARC)* by Kan Paul Chen, John Miles.
4. Sussman, J. M., *Perspective on ITS*, Artech House Publishers, 2005.
5. National ITS Architecture Documentation, US Department of Transportation, 2007

TRAFFIC ANALYSIS
(Professional Elective- 4)

M.Tech. I Year II-Sem (Transportation Engineering)

L	T	P	C
3	0	0	3

Prerequisites: - Nil

Objectives:

- This module focuses on traffic, its properties, measurement, simulation and control.
- Traffic flow variables and their measurement. Traffic flow and queuing theory is introduced. Survey methods and data analysis techniques required by traffic engineers are presented.
- Analysis of pedestrian delays and warrants.

UNIT - I

Traffic Flow Description: Traffic Stream Characteristics and Description Using Distributions: Measurement, Microscopic and Macroscopic Study of Traffic Stream Characteristics - Flow, Speed and Concentration; Use of Counting, Interval and Translated Distributions for Describing Vehicle Arrivals, Headways, Speeds, Gaps and Lags; Fitting of Distributions, Goodness of Fit Tests.

UNIT - II

Traffic Stream Models: Fundamental Equation of Traffic Flow, Speed-Flow-Concentration Relationships, Normalized Relationship, Fluid Flow Analogy Approach, Shock Wave Theory - Flow-Density diagram use in Shockwave analysis; Use of Time-space diagram for shockwave description; Bottleneck situations and shockwaves; traffic signal and shockwave theory; numerical Examples for application of shockwave theory; Car-Following Theory.

UNIT - III

Queuing Analysis: Fundamentals of Queuing Theory, Demand Service Characteristics, Deterministic Queuing Models, Stochastic Queuing Models, Multiple Service Channels, Analysis of M/M/1 system; Assumptions and Derivation of System State Equations; Application of M/M/1 analysis for parking Garages and Toll Plazas- numerical Examples; Analysis of D/D/1 system for delay characteristics; Traffic Signal analysis as D/D/1 system; Computation of delays and queue dissipation Time – Numerical Examples.

UNIT - IV

Pedestrian Delays And Gaps: Pedestrian Gap acceptance and delays; Concept of Blocks, Anti-blocks, Gaps and Non-Gaps; Underwood's analysis for Pedestrian Delays; Warrants for Pedestrian Crossing Facilities – Minimum Vehicular Volume Warrant, Minimum Pedestrian Volume Warrant, Maximum Pedestrian Volume Warrant;

UNIT - V

Simulation of Traffic: Introduction, Advantages of Simulation techniques, Steps in Simulation, Scanning techniques, Example of Simulation.

Course Outcomes:

At the end of the course, the students will be able to

- Estimate basic characteristics of traffic stream.
- Conduct traffic studies and analyze traffic data.
- Understand traffic queue system.
- Understand the pedestrian delays & gaps.
- Understand simulation techniques.

References Books:

1. Traffic Flow Theory: A Monograph , TRB Special Report 165.
2. Fundamentals of Transportation Engineering – C.S.Papacostas, Prentice Hall India Publication.
3. Principles of Highway Engineering and Traffic Analysis – F.L.Mannering & W.P.Kilareski, John Wiley Publishers.
4. Traffic Flow Fundamentals – A.D.May, , Prentice Hall India Publication.
5. Fundamentals of Traffic Engineering – McShane & Rogers,1977.

TRAFFIC MANAGEMENT AND DESIGN
(Professional Elective- IV)

M.Tech. I Year I-Sem (Transportation Engineering) **L T P C**
3 0 0 3

Objectives:
The students of Transportation Engineering will acquire knowledge to

- Understand the Transportation noise standards, measurements and mitigation strategies
- Identify the Statistical methods for data analysis to improve safety.

UNIT - I:
Traffic Impact: Transportation noise: standards, measurements and mitigation strategies Parking Studies:. Statistics and analysis. Fuel Consumption and vehicle operating cost. Vehicular emission and Air quality modeling. Environmental impact assessment.

UNIT - II
Traffic safety: Accident studies, Accident data analysis, Statistical methods for data analysis, Road safety principles and practice, Identification of hazardous locations.

UNIT - III
Capacity and LOS analysis : Two Lane Highways, Urban Streets, Multilane Highways,Transit systems, Pedestrians and bicycles Facilities. Intersection, roundabout configuration and design, Interchange design, Freeway Operations and design.

UNIT - IV
Traffic Management: Traffic Management Strategies, Traffic Management Techniques, Work zone traffic management, Traffic calming, Congestion studies and Road pricing.

Automated Data Collection Systems: Intrusive systems such as loop detectors, pneumatic, Non-Intrusive systems such as video, infrared, In-vehicle systems: GPS, Mobiles, Tracking; Positioning systems for location services, Geographical information systems

UNIT - V
Intelligent Transportation System: ITS: User services and architecture, ITS: Standards and evaluation, Public transport and bus priority, Travel time estimation methods, Artificial intelligence in advanced traffic and ITS

Course outcomes:-

This course will provides adequate exposure to various traffic management and design of facilities**.**

References Books:

1. C. S. Papacostas and P. D. Prevedouros. Fundamentals of Transportation Engineering. Prentice-Hall, New Delhi, 2009.
2. C. Jotin Khisty, B. Kent Lall, Transportation Engineering: An Introduction, Prentice Hall, 2003.
3. N. J. Garber, L. A. Hoel, Traffic and Highway Engineering,Cengage Learning, 2008.
4. L. R Kadiyali. Traffic Engineering and Transportation Planning.Khanna Publishers, New Delhi, 2008.
5. Highway Capacity Manual. Transportation Research Board.National Research Council, Washington, D.C., 2010.
6. F. L. Mannering, S. S. Washburn and W. P. Kilareski, Principles of Highway Engineering and Traffic Analysis, Wiley India, 2011.
7. T. R. Currin, Introductions to Traffic Engineering: A Manual for Data Collection and Analysis. Brooks/Cole Thomason Learning,Canada, 2001.
8. Hensher, D.A. and K.J. Button (eds) (2003) Handbook of Transport and the Environment, Handbooks in Transport #4, Amsterdam:Elsevier.
9. M A Chowdhary and A Sadek. Fundamentals of Intelligent Transportation systems planning. Artech House Inc., US, 2003.
10. Sussman, J. Perspectives on Intelligent Transportation Systems(ITS). New York, NY: Springer, 2005.

PAVEMENT EVALUATION & PERFORMANCE LABORATORY

M.Tech. I Year II-Sem (Transportation Engineering)

L	T	P	C
0	1	2	2

Prerequisites:- Nil

Objectives:

The students will acquire knowledge about

- The various assessment techniques of the pavement.
- The mix design of pavement.
- Visual analysis and other pavement characteristics.

Pavement Evaluation

1. Mix Design of Pavement (MS2).
2. Deflection Assessment on Pavement (FWD).
3. Density Assessment on Pavement (DCP).
4. Surface Condition Assessment (PCI).
5. Visual Condition Analysis of Pavement –Ride rating.
6. Pavement Failure-Analysis.
7. Impact of Road Geometric on Skid Resistance.
8. Introduction to Forensic investigation of pavements.
9. Road safety Auditing.

Course Outcomes:

At the end of the course, students will be able to:

- Design and assess various pavement components.
- Analyze pavement failures and their characteristics.

TRAFFIC & TRANSPORTATION PLANNING STUDIO LABORATORY

M.Tech. I Year II-Sem (Transportation Engineering)

L	T	P	C
0	1	2	2

Prerequisites:- Nil

Objectives:

The students will acquire knowledge about

- The various characteristics of the road network.
- Parking and congestion pavements.
- Road safety analysis methods and importance of ITS.

1. Road Network Characterization
2. Road Geometric Audit
3. Traffic Counting Devices-Design
4. ITS Interface to Traffic Control and Monitoring
5. Land Use and Transportation Infrastructure
6. Parking Structures
7. Congestion Pricing Analysis
8. Road Safety Analysis

Course Outcomes:

At the end of the course, the students will be able to:

- Analyze various traffic related issues.
- Analyze congestion pricing and road safety.
- Understand the importance of ITS and Land use to improve traffic conditions.

MINI PROJECT WITH SEMINAR

M.Tech. I Year II-Sem (Transportation Engineering)

L	T	P	C
0	0	4	2

Course Outcomes:-

At the end of the course, the student will be able to:

- Identify Transportation Engineering problems, reviewing available literature.
- Study different techniques used to analyze complex structural systems.
- Work on the solutions given and present solution by using his/her technique applying engineering principles.

Course Contents:-

The Student should be able to collect information on a specialized topic, prepare a technical report and present it to the committee.

DISASTER ANALYTICS
(Program Elective- V)

M.Tech. II Year I-Sem (Transportation Engineering)

L	T	P	C
3	0	0	3

Prerequisites: - Nil

Objectives:

- Discuss the various disasters and the factors contributing to disasters.
- Modelling and simulation technique to be applied.
- Discuss the concepts of monitoring and mitigation.

UNIT - I

Disaster Introduction: Disasters-types – Man made & Natural disasters- causes and factors contributing to disasters, Impacts of disasters.

UNIT - II

Disaster – Polices: Policy on infrastructure to counter disasters, policy on safety at common areas, policy on water floods and with reference to emissions in industrial areas.

UNIT - III

Disaster-Technology Interface: Mapping of disasters, sensor technologies to monitor disasters, Power resilient system during disasters of natural, monitoring mechanism on disasters generating from air, water and traffic.

UNIT - IV

Disasters –simulations and communication: Problem defining on disasters, IOT based communication to monitor certain disaster, Modeling to quantify disaster, simulation of disaster for infrastructure plan.

UNIT - V

Case examples on disasters: Mapping and measuring of flood as disaster. Road accidents and its impact on society, pollution in urban cities, congestion pricing and its impact on economy.

Course Outcomes:

At the end of the course, students will be able to

- Understand the various disasters and their impact.
- Understand the urban policies related to disasters.
- Find methods to monitor disasters.
- Understand ways to quantify and plan infrastructure.
- Understand the concepts of Mapping and measuring disasters.

Reference Books:

1. Coppola DP, 2007 Introduction to International Disaster Management, Elesevier Science (B/4) London.
2. Manual on Natural Disaster Management in India, MC Gupta NIDM, New Delhi.
3. Disaster Management act 2005, Published by Govt of India.
4. R.B. Singh (Ed) Disasters Management, Universities press, India 2003.
5. R.K. Bandari – An overview on Natural and Man-Made Disaster & their Reduction, CSIR, New Delhi

RURAL ROADS
(Program Elective- V)

M.Tech. II Year I-Sem (Transportation Engineering)

L	T	P	C
3	0	0	3

Prerequisites:- Nil

Objectives:

- This course focuses on planning of rural roads as well as design of pavements.
- Various specifications for construction of rural roads is discussed.
- The importance of quality control construction and maintenance of rural roads is discussed.

UNIT - I

Planning and Alignment: Planning of Rural Roads, Concept of Network planning, rural roads planning, road alignment and surveys, governing factors on route selection, factors considered for alignment.

UNIT - II

Materials and Pavement Design: Introduction-Soil ,material surveys, embankment and subgrade materials, stabilized Soils, Road aggregates- for base courses, new materials as stabilizers, materials for desert areas, bituminous constructions and surfacing; materials for rigid pavements, special pavements, climatic suitability of concrete materials. Introduction, design procedure, pavement components, design of flexible and rigid pavements, special pavements design, types of drainage, and general criteria for road drainage, system of drainage, surface and subsurface systems.

UNIT - III

Construction and Specifications: Introduction, selection of materials and Methodology, Embankment and subgrade, sub – base (granular), base(granular), shoulders, bituminous concrete, semi- rigid pavements-construction, concrete pavements, construction of special pavements, equipment required for different procedures.

UNIT - IV

Waste material for pavement construction: Introduction, fly ash for road construction, design & construction, design &construction of fly ash embankment lime fly ash and stabilized soil, lime fly ash pavements, control of compaction, concrete stabilized fly ash with admixtures.

UNIT - V

Quality Control in Construction and Maintenance: Introduction, Pre-requirements, organizational setup, specification and code of practice, Laboratory equipment, Earth and granular layers, bituminous courses, semi- rigid and rigid pavements, special requirements, required of quality control data. Distresses/Defects in rigid and flexible pavements, Maintenance and evaluation, inventory roads and inspections, types of Maintenance Activities, Maintenance.

Course Outcomes:

At the end of the course, the students will be able to

- Understand the concepts of planning and alignment of rural road networks.
- Gain knowledge of the materials and pavement design for rural roads.
- Understand the construction and specifications for rural roads.
- Understand the importance of waste materials for pavement construction**.**
  Understand the importance of quality control in construction and maintenance of rural roads.

Reference Books:

1. IRC manual for rural roads. Special publication – 20(2002)
2. HMSO, Soil Mechanics for rural Engineers in, London
3. IRC related code books
4. NRRDA – guidelines and code books

PAVEMENT CONSTRUCTION MAINTENANCE AND MANAGEMENT
(Program Elective- V)

M.Tech. II Year I-Sem (Transportation Engineering)

L	T	P	C
3	0	0	3

Prerequisites: - Nil

Course Objectives:

- Able to recognize and use current pavement design procedures.
- Understanding common design and construction features important to the performance of both asphalt and concrete pavements.
- The ability to design and recognize specification and construction activities that can improve the performance of pavements.
- Evaluating the condition of pavements through surface condition surveys, smoothness, friction, load/deflection and other evaluation techniques.
- Understanding the basic components of pavement management systems and how they can be used to optimize funding expenditures.

UNIT - I

Pavement Management System: Components of PMS and their activities; Major steps in implementing PMS; Inputs; Design, Construction and Maintenance; Rehabilitation and Feedback systems; Examples of HDM and RTIM packages; Highway financing; Fund generation; Evaluating alternate strategies and Decision criteria ; Pavement Maintenance Management, Components of Maintenance Management and Related Activities – Network and Project Level Analysis; Prioritization Techniques and Formulation of Maintenance Strategies.

UNIT - II

Pavement Inventories, Quality Control and Evaluation: Serviceability Concepts ;Visual Rating ;Pavement Serviceability Index; Roughness Measurements ;Distress Modes – Cracking Rutting Etc; Pavement Deflection – Different Methods and BBD, Skid Resistance, Roughness, Safety – Aspects; Inventory System. Causes of Deterioration, Traffic and Environmental Factors, Pavement Performance Modeling Approaches and Methods of Maintaining WBM, Bitumen and Cement Concrete Roads, Quality Assurance; Quality Control – ISO 9000, Sampling Techniques – Tolerances and Controls related to Profile and Compaction.

UNIT - III

Construction of Base, Subbase, Shoulders and Drain: Roadway and Drain Excavation, Excavation and Blasting, Embankment Construction, Construction of Gravel Base, Cement Stabilised Sub- Bases, WBM Bases, Wet Mix Construction; Crushed Cement Bases, Shoulder Construction; Drainage Surface, Turfing Sand Drains; Sand Wicks; Rope Drains, Geo- Textile Drainage; Preloading Techniques.

UNIT - IV

Bituminous Construction and Maintenance: Preparation and Laying of Tack Coat; Bituminous Macadam ,Penetration Macadam, Built up Spray Grout, Open Graded Premix, Mix Seal, Semi-Dense Asphalt Concrete-Interface Treatments and Overlay Construction, IRC and MoRT&H Specifications.

UNIT - V

Cement Concrete pavement Construction and Maintenance: Cement Concrete Pavement maintenance- Construction of Cement Roads, Manual and Mechanical Methods, Joints in Concrete and Reinforced Concrete Pavement and Overlay Construction.

Course Outcomes:

At the end of the course, students will be able to:

- Understand the concepts of PMS and evaluate strategies for pavement maintenance.
- Evaluate the pavements based on the functional and structural characteristics.
- Understand constructions of Construction methods of Base, Subbase, Shoulders and drains.
- Understand constructions of bituminous pavements.
- Understand the concepts of construction and maintenance of cement concrete pavements.

References:

1. Haas and Hudson , W. R. Pavement management systems –McGraw Hill publications.
2. Sargious, M. A. – Pavements and surfacing for highways and airports – Applied Science Publishers ltd.
3. Bridge and Pavement maintenance- Transportation Research Record no.800, TRB.
4. Shahin M.Y, 1994- Pavement management for airports, roads and parking lots.
5. Bent Thagesan, 1996- Highway and Traffic engineering for developing countries.
6. MORTH - Specifications.

GREEN BUILDING TECHNOLOGY (OE)

M.Tech. II Year I-Sem (Transportation Engineering)

L	T	P	C
3	0	0	3

Course Objectives:

- Exposure to the green building concepts and their significance.
- Understand the judicious use of energy and its management.
- Enhance awareness of end-user energy requirements in the society.
- Develop suitable technologies for energy management.

UNIT-I

Overview of the significance of energy use and energy processes in building - Indoor activities and environmental control - Internal and external factors on energy use and the attributes of the factors - Characteristics of energy use and its management - Macro aspect of energy use in dwellings and its implications.

UNIT-II

Indoor environmental requirement and management - Thermal comfort - Ventilation and air quality – Air-conditioning requirement - Visual perception - Illumination requirement - Auditory requirement.

UNIT-III

Climate, solar radiation and their influences - Sun-earth relationship and the energy balance on the earth's surface - Climate, wind, solar radiation, and temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings.

UNIT-IV

End-use, energy utilization and requirements - Lighting and day lighting - End-use energy requirements - Status of energy use in buildings Estimation of energy use in a building. Heat gain and thermal performance of building envelope - Steady and non-steady heat transfer through the glazed window and the wall - Standards for thermal performance of building envelope - Evaluation of the overall thermal transfer.

UNIT-V

Energy management options - Energy audit and energy targeting - Technological options for energy management.

Course Outcomes:

- Understand the fundamentals of energy use and energy processes in building.
- Identify the energy requirement and its management.
- Know the Sun-earth relationship vis-a-vis its effect on climate.
- Be acquainted with the end-user energy requirements.
- Be familiar with the audit procedures of energy.

REFERENCE:

1. Bryant Edwards (2005): Natural Hazards, Cambridge University Press, U.K.
2. Carter, W. Nick, 1991: Disaster Management, Asian Development Bank, Manila.
3. Sahni, Pardeep et.al. (eds.) 2002, Disaster Mitigation Experiences and Reflections,
4. Prentice Hall of India, New Delhi.
5. Bryant Edwards (2005): Natural Hazards, Cambridge University Press, U.K.

CONSTRUCTION PROJECT MANAGEMENT(OE)

M.Tech. II Year I-Sem (Transportation Engineering) **L T P C**
3 0 0 3

Course Objectives:

The student will be able to understand:

- The different phases of the project
- And prioritize the various activities
- The importance of resources allocation
- And identify the various factors affecting the project for better risk management

UNIT –I

Introduction: Phase of project, project management and its relevance, stakeholders of a project, structure of project organization, management levels, and traits of a project manager.

UNIT –II

Construction Planning: Introduction, activities involved types of project plan, work breakdown structure. Planning terminologies, Critical path method, forward and backward pass, AOA, AON, Precedence Diagramming Method (PDM), PERT, Line of balance,

UNIT –III

Project scheduling and resource levelling: Introduction, Resource allocation and levelling for unlimited resources, Resource allocation for limited resources, Multi resource allocation, Optimal scheduling.

UNIT –I V

Project Monitoring and Control: Introduction, Project updating, Time Cost Trade off Analysis and Earned Value Analysis. IT tools for project data updating.

UNIT –V

Project Risk Management: Risk register, identification, evaluation, allocation, avoidance and sharing of risk. Delay Analysis and Case Studies.

Course Outcomes:

- Plan and develop project organization for executing construction projects.
- Prepare work break down plan and estimate resources requirements.
- Learn the techniques used for planning, scheduling and control of construction projects.
- Apply the techniques for a real-world project and demonstrate the learning.

References:

1. Construction project scheduling and control. Mubarak, Saleh A, John Wiley & Sons, 2015, 3rd Edition.

2. Construction project management: Theory and practice. Jha, Kumar Neeraj, Pearson Education India, 2011, First Edition.

3. Project management: strategic design and implementation, Cleland, David I. McGraw-Hill Education, 2007, 5th Edition.

3. Construction project scheduling. Callahan, Michael T., Daniel G. Quackenbush, and James E. Rowings. McGraw-Hill 1992, 1st Edition.

4. Construction project management. Clough, Richard H., Glenn A. Sears, and S. Keoki Sears. John Wiley & Sons, 2000, 4th Edition.

5. Project management for engineering and construction. Oberlender, Garold D. McGraw-Hill Education, 2014, First Edition.

6. Precedence and arrow networking techniques for construction. Harris, Robert Blynn. University of Michigan, 1973, First Edition.

7. Critical chain: A business novel. Goldratt, E. M., Routledge, 2017.

8. Project management body of knowledge (pmbok® guide), Guide, A., In Project Management Institute, 2021, Seventh Edition.

9. Construction Project Management - Guidelines: Part 1 General, IS 15883 (Part 1), Bureau of Indian Standards, 2009.

10. Construction Project Management - Guidelines: Part 2 Time Management, IS 15883 (Part 2), Bureau of Indian Standards, 2013.

SAFETY AND CONSTRUCTION PRACTICE REGULATIONS (OE)

M.Tech. II Year I-Sem (Transportation Engineering) **L T P C**

3 0 0 3

Course Objectives:

The student will be able to understand :

- The various issues related to construction.
- The importance of safety in the construction.
- The various government regulations.

UNIT-I

Introduction to Construction Industry- Safety issues in construction- Human factors in construction safety management. Roles of various groups in ensuring safety in construction industry. Framing Contract conditions on safety, and related matters. Relevance of ergonomics in construction safety.

UNIT-II

Safety in various construction operations- Excavation- under- water works- under- pinning &shoring Ladders & Scaffolds- Tunneling- Blasting- Demolition- Pneumatic caissons- confined Space Temporary Structures. Indian Standards on construction safety- National Building Code Provisions on construction safety.

UNIT-III

Safety in material handling and equipments-Safety in storage & stacking of construction materials.

UNIT-IV

Safety in these of construction equipments- Vehicles, Cranes, Tower Cranes, Lifting gears, Hoists & Lifts, Wire Ropes, Pulley blocks, Mixers, Conveyors, Pneumatic and hydraulic tools in construction. Temporary power supply.

UNIT-V

Contract Labor (R&A) Act and Central Rules: Definitions, Registration of Establishments, Licensing of Contractors, Welfare and Health provisions in the Act and the Rules, Penalties, Rules regarding wages. Building & Other Construction Workers (RE&CS) Act,1996 and Central Rules, 1998: Applicability, Administration, Registration, Welfare Board & Welfare Fund, Training of Building workers, General Safety, Health & Well fare provisions, Penalties.

Course Outcomes:

References:

1.K.N.Vaid, Construction Safety Management.
2. V.J. Davies and K.Tomasin, Construction Safety Handbook.
3. James B.Fullman, Construction Safety, Security & Loss Prevention
4.LingerL,Modern Methods of Material Handling
5. R.T. Ratay, Hand book of Temporary Structures in Construction.
6. National Building Code of India
7.Relevant Indian Standards published by BIS

ENGLISH FOR RESEARCH PAPER WRITING
(AUDIT COURSE I & II)

M.Tech. (Transportation Engineering)

L	T	P	C
2	0	0	0

Prerequisites:- NIL

Objectives:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

UNIT - I

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT - II

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT - III

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT - IV

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

UNIT - V

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, and skills are needed when writing the Conclusions

UNIT - VI

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Reference Books:-

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook.
2. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

DISASTER MANAGEMENT
(AUDIT COURSE I & II)

M.Tech. (Transportation Engineering)

L	T	P	C
2	0	0	0

Prerequisites:- NIL

Objectives: -

- Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

UNIT - I

Introduction: Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT - II

Repercussions Of Disasters And Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT - III

Disaster Prone Areas In India: Study of Seismic Zones; Areas prone to Floods and Droughts, Landslides and Avalanches; Areas prone to Cyclonic and Coastal Hazards with special reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT - IV

Disaster Preparedness And Management: Preparedness: Monitoring of Phenomena triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and other Agencies, Media Reports: Governmental and Community preparedness.

UNIT - V

Risk Assessment: Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

UNIT - VI

Disaster Mitigation: Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

Reference Books;-

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep &Deep Publication Pvt. Ltd., New Delhi.

SANSKRIT FOR TECHNICAL KNOWLEDGE
(AUDIT COURSE I & II)

M.Tech. (Transportation Engineering)

L	T	P	C
2	0	0	0

Prerequisites:- NIL

Course Objectives

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects
- enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the
- huge knowledge from ancient literature.

UNIT - I

Alphabets in Sanskrit,-Past/Present/Future Tense, - Simple Sentences

UNIT - II

Order - Introduction of roots - Technical information about Sanskrit Literature

UNIT - III

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Course outcome:-

At the end of the course, the students will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science & technology can be understood
- Being a logical language will help to develop logic in students

Reference Books:-

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

VALUE EDUCATION

(AUDIT COURSE I & II)

M.Tech. (Transportation Engineering)

L	T	P	C
2	0	0	0

Objectives:

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

UNIT - I

Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism.- Moral and non- moral valuation. Standards and principles-Value judgements.

UNIT - II

Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline.

UNIT - III

Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness.-Avoid fault Thinking.- Free from anger, Dignity of labour. - Universal brotherhood and religious tolerance. - True friendship. - Happiness Vs suffering, love for truth. - Aware of self-destructive habits. - Association and Cooperation. - Doing best for saving nature.

UNIT - IV

Character and Competence –Holy books vs Blind faith. Self-management and Good health. - Science of reincarnation. - Equality, Non-violence, Humility, Role of Women. - All religions and same message. -Mind your Mind, Self-control. - Honesty, Studying effectively.

Course Outcomes:

At the end of the course, the students will be able to

- Knowledge of self-development
- Learn the importance of Human values
- Developing the overall personality

Reference Book:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

INDIAN CONSTITUTION
(AUDIT COURSE I & II)

M.Tech. (Transportation Engineering)

L	T	P	C
2	0	0	0

Prerequisites:- NIL

Objectives:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

UNIT - I

History of Making of the Indian Constitution: History
Drafting Committee, (Composition & Working)

UNIT - II

Philosophy of the Indian Constitution:
Preamble
Salient Features

UNIT - III

Contours of Constitutional Rights & Duties: Fundamental Rights - Right to Equality - Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Directive Principles of State Policy - Fundamental Duties.

UNIT - IV

Organs of Governance: Parliament - Composition - Qualifications and Disqualifications - Powers and Functions - Executive - President - Governor - Council of Ministers -Judiciary, Appointment and Transfer of Judges, Qualifications - Powers and Functions.

UNIT - V

Local Administration: District's Administration head: Role and Importance, -Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.- Pachayati raj: Introduction, PRI: ZilaPachayat - Elected officials and their roles, CEO ZilaPachayat: Position and role. -Block level: Organizational Hierarchy (Different departments), -Village level: Role of Elected and Appointed officials, - Importance of grass root democracy

UNIT - VI

Election Commission: Election Commission: Role and Functioning.- Chief Election Commissioner and Election Commissioners. - State Election Commission: Role and Functioning. - Institute and Bodies for the welfare of SC/ST/OBC and women.

Course Outcomes:

At the end of the course, students will be able to

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

Reference Books:-

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

PEDAGOGY STUDIES
(AUDIT COURSE I & II)

M.Tech. (Transportation Engineering)

L	T	P	C
2	0	0	0

Prerequisites:- NIL

Objectives:

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

UNIT – I

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education.- Conceptual framework, Research questions.- Overview of methodology and Searching.

UNIT - II

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. - Curriculum, Teacher education.

UNIT - III

Evidence on the effectiveness of pedagogical practices ,Methodology for the in depth stage: quality assessment of included studies.- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change.- Strength and nature of the body of evidence for effective pedagogical practices.- Pedagogic theory and pedagogical approaches.- Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT - IV

Professional development: alignment with classroom practices and follow-up support -Peer support - Support from the head teacher and the community. - Curriculum and assessment - Barriers to learning: limited resources and large class sizes.

UNIT - V

Research gaps and future directions

Research design – Contexts - Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

Course Outcomes

At the end of the course, the students will be able to understand

- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?

- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Reference Books:-

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2):245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

STRESS MANAGEMENT BY YOGA
(AUDIT COURSE I & II)

M.Tech. (Transportation Engineering)

L	T	P	C
2	0	0	0

Prerequisites:- NIL

Objectives

- To achieve overall health of body and mind
- To overcome stress

UNIT - I

Definitions of Eight parts of yog. (Ashtanga)

UNIT - II

Yam and Niyam.

Do`s and Don't's in life. i) Ahinsa, satya, astheya, bramhacharya and aparigraha

ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT - III

Asan and Pranayam

i) Various yog poses and their benefits for mind & body

ii)Regularization of breathing techniques and its effects-Types of pranayama

Course Outcomes:

At the end of the course, the students will be able to

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

Reference Books:-

1. 'Yogic Asanas for Group Tarining-Part-I" :Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS (AUDIT COURSE I & II)

M.Tech. (Transportation Engineering)

L	T	P	C
2	0	0	0

Prerequisites:- NIL

Objectives

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

UNIT - I

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)
- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

UNIT - II

- Approach to day to day work and duties.
- Shrimad BhagwadGeeta : Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

UNIT - III

Statements of basic knowledge

- Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad BhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

Course Outcomes

At the end of the course, the students will be able to

- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students.

Reference Books:-

1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath,
3. Rashtriya Sanskrit Sansthanam, New Delhi.