G H RAISONI COLLEGE OF ENGINEERING

(An Autonomous Institute affiliated to RashtrasantTukadojiMaharaj Nagpur University, Nagpur)

Accredited by NAAC with 'A+' Grade

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M. TECH.TRANSPORTATION ENGINEERING

VISION & MISSION OF INSTITUTE

VISION

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards with capabilities of accepting new challenges

MISSION

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stake-holders. Our strength is directed to create competent professionals. Our endeavour is to provide all possible support to promote research and development activities

VISION & MISSION OFCIVIL ENGINEERING PROGRAM

VISION

To achieve excellent standards of quality education in Civil Engineering by keeping pace with rapidly changing technologies & to create technical manpower of Global Standards in Civil Engineering with capabilities of accepting new challenges.

MISSION

1. To impart quality and value based education to raise satisfaction of all stake holders.
2. To serve society and nation for providing professional leadership in Civil Engineering for solving the problems consistent with rapidly changing technologies.
3. To create competent Civil Engineering professionals who are trained in the design and implementation of Civil Engineering systems.
4. To promote Research & Development Activities in the field of Civil Engineering and allied areas.

M. TECH. (TRANSPORTATION ENGG.)

Programme Educational Objectives (PEOs)

The educational objectives of the programme are designed to produce competent engineers who shall:

1. Apply knowledge of Transportation system analysis, design, modeling and simulation to provide solutions to industrial problems in diverse domains.
2. Undertake the professional career by developing system and services to address social, technical and economical challenges and needs.
3. To do research under collaborative and multidisciplinary environments using modern tools, processes and creative efforts.

Programme Outcomes (POs)

On completion of the M. Tech. (Transportation Engineering) programme, the students shall be able to:

PO1: Independently carry out research /investigation and development work to solve practical problems.

PO2: Write and present a substantial technical report/document.

PO3: Demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4: Develop ability to learn reflectively from mistakes, engage in lifelong learning, adapt new developments and participate in continuing education opportunities to foster personal and organizational growth..

PO5: Provide technical solutions to society with integrity, ethical behavior and commitment to code of conduct of professional practices and standards.

PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO1: An ability to recognize the importance of Civil Engineering professional development by pursuing postgraduate studies

PSO2: An ability to apply design, develop and execution of projects in the construction of various Civil Engineering disciplines

PSO3: An ability to face competitive examinations that offer challenging and rewarding careers and demonstrating leadership to emerged as potential entrepreneur.

M.TECH TRANSPORTAION ENGINEERING SCHEME (CIVIL ENGINEERING)

Subject Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						ESE Duration (Hrs)	Mode of Exam (Online / Off Line)
							Theory			Practical				
		Th.	Tu.	Pr.	Total Hours		TAE	CAE	ESE	Int.	Ext.	Total		
SEM-I														
TNSL 421	Applied Statistics & Optimization Methods	3	-	-	3	3	20	30	50	-	-	100	3 hrs	Off Line
TNSL 422	Traffic Engineering	3	-	-	3	3	20	30	50			100	3 hrs	Off Line
TNSP 423	Traffic and Highway Engineering Laboratory	-	-	2	2	1	-	-	-	25	25	50	--	practical
TNSL XXX	Elective – I	3	-	-	3	3	20	30	50	-	-	100	3 hrs	Off Line
TNSP XXX	Elective – I	-	-	2	2	1	-	-	-	25	-	25	-	Practical
TNSL XXX	Elective – II	3	-	-	3	3	20	30	50	-	-	100	3 hrs	Off Line
TNSL XXX	Elective – III	3	-	-	3	3	20	30	50	-	-	100	3 hrs	Off Line
MBA 602	Advanced Communication Skills	-	-	2	2	1	-	-	-	25	-	25	-	Off Line
	TOTAL	15	00	06	21	18	100	150	250	75	25	600		

List of Elective I				
1.	TNSL 551	Advanced Highway Materials	TNSP 551	Advanced Highway Materials
2.	TNSL 552	Transportation and Traffic Infrastructure Design	TNSP 552	Transportation and Traffic Infrastructure Design
3.	TNSL553	Transportation System Analysis and Modeling	TNSP553	Transportation System Analysis and Modeling
List of Elective-II				
1.	TNSL 554	Environmental impact on Various Transportation system		
2.	TNSL 555	Transportation Safety and management		
3.	TNSL 556	Bridge Engineering		
List of Elective-III				
1.	TNSL 557	Advanced Traffic Management System		
2.	TNSL 558	Communication Standards used in Transportation		
3.	TNSL559	Transportation Network Analysis		
4.	TNSL560	Ground Improvement Techniques		

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Subject Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						ESE Duration (Hrs)	Mode of Exam (Online / Off Line)
							Theory			Practical				
		Th.	Tu.	Pr.	Total Hours		TAE	CAE	ESE	Int.	Ext.	Total		
SEM-II														
TNSL 424	Traffic Flow Theory	3	-	-	3	3	20	30	50	-	-	100	3 hrs	Offline
TNSP 425	Traffic Flow Theory	-	-	2	2	1	-	-	-	25	-	25	-	Practical
TNSL 426	Intelligent Transportation System	3	-	-	3	3	20	30	50	-	-	100	3 hrs	Online
TNSL XXX	Elective - IV	3	-	-	3	3	20	30	50	-	-	100	3 hrs	Offline
TNSL XXX	Elective - V	3	-	-	3	3	20	30	50	-	-	100	3 hrs	Offline
TNSL XXX	Elective - VI	3	-	-	3	3	20	30	50	-	-	100	3 hrs	Offline
TNSP 427	Transportation System Software Laboratory	-	-	2	2	1	-	-	-	25	25	50	--	Practical
IDA403	Research Methodology	-	-	2	2	1	-	-	-	25	-	25	--	
	TOTAL	15	-	06	21	18	100	150	250	75	25	600		

List of Elective IVI		
1.	TNSL561	Transducers & Sensors
2.	TNSL562	Soft Computing
3.	TNSL563	Urban Transportation Planning
4.	TNSL 564	Computer Aided Transportation Engineering
List of ElectiveV		
1.	TNSL 565	Highway Traffic Analysis and Pavement Design
2.	TNSL 566	Transportation Economics and Finance
3.	TNSL 567	Public Transportation Planning and Design
4.	TNSL 568	Railway Infrastructure Planning and Design
List of Elective VI		
1	TNSL569	Waterway Infrastructure Planning and Design
2	TNSL570	Airport Planning and Design
3	TNSL571	GIS and Remote Sensing
4	TNSL572	Pavement Design and Analysis
5	TNSL573	Project Management

M.TECH TRANSPORTAIONENGINEERING SCHEME (CIVIL ENGINEERING)

Subject Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						ESE Duration (Hrs)	Mode of Exam (Online / Off Line)
							Theory			Practical				
		Th.	Tu.	Pr.	Total Hours		TAE	CAE	ESE	Int.	Ext.	Total		

SEM-III														
TNSP 574	**Industry project/ Research Project (Phase –I)**	-	-	09	09	09	-	-	-	150	-	150	-	Off Line
	TOTAL	-	-	09	09	09	-	-	-	150	-	150	-	

M.TECH TRANSPORTAION ENGINEERING SCHEME (CIVIL ENGINEERING)

Subject Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						ESE Duration (Hrs)	Mode of Exam (Online / Off Line)
							Theory			Practical				
		Th.	Tu.	Pr.	Total Hours		TAE	CAE	ESE	Int.	Ext.	Total		
SEM-IV														
TNSP 575	**Industry project/ Research Project(Phase –II)**	-	-	15	15	15	-	-	-	150	150	300	-	Off Line
	TOTAL	-	-	15	15	15	-	-	-	150	150	300	-	

SEMESTER-I

TNSL 421 APPLIED STATISTICS & OPTIMIZATION METHODS

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Understand various types of flow distributions in traffic flow theory.
2. Understand different tests of significance and correlation of the data.
3. Apply various mathematical modelling techniques to traffic engineering problems.
4. Understand problems associated to find optimal solutions.
5. Solve optimization problems using various methods.
6. Perform optimization problems such as route optimization, transit schedule optimization etc.

Unit 1. [7 Hrs]

Collection and presentation of data; Measures of central tendency;Elementary probability theory; Random events; Baye's theorem; Random variables and distributions; Derived Distributions; Moments and Expectations;

Unit 2. [7 Hrs]

Common probabilistic models; Statistical inference; Estimation of parameters; Tests of hypotheses and significance; Goodness of fit tests; Regression and correlation analysis;

Unit 3. [7 Hrs]

Design of Experiments,Basics of engineering analysis and design, need for optimal design, formulation of optimal design problems

Unit 4. [7 Hrs]

Basic difficulties associated with solution of optimal problems, classical optimization methods, necessary and sufficient optimality criteria for unconstrained and constrained problems Global optimality and convex analysis, linear optimal problems, Simplex method

Unit5. [7 Hrs]

Numerical methods for nonlinear unconstrained and constrained problems,Sensitivity analysis, linear post optimal analysis, sensitivity analysis of discrete and distributed systems

Unit 6.[7 Hrs]

Introduction to integer programming, dynamic programming, stochastic programming and geometric programming, introduction to genetic algorithm.

Reference Books

1. Benjamin, J.R. Benjamin and C.A. Cirbekk, Probability Statistics and Decision for Civil Engineers, McGraw-Hill, 1970.
2. H.S. Ang and W. H. Tang, Probability Concepts in Engineering, Planning and Design, John Wiley, 1975.
3. Erwin Kreyszig, Introductory Mathematical Statistics, John Wiley, 1970
4. K. Deb., Optimization for Engineering Design: Algorithms and Examples, PHI Pvt Ltd., 1998.
5. R. C. Larson and A. R. Odoni, Urban Operations Research (Available at: http://web.mit.edu/urban_or_book/www/book/)
6. Ravindran, Philips and Solberg, Operations Research: Principles and Practices, 2nd Edition, Wiley, 2006

TNSL422 TRAFFIC ENGINEERING

Teaching	Cre	Evaluation Scheme

Scheme				dits	Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Understand the fundamental traffic flow theories and identify basic traffic variables and their relationships including speed, density and flow.
2. Analyze a variety of traffic facilities and evaluate capacity and level of service (LOS).
3. Design signalized intersections including isolated, coordinated and roundabouts.
4. Assess, evaluate and justify methods of traffic management and control.
5. Understand the use of advanced simulation methods for the analysis of traffic systems and software tools for the design of traffic control strategies.
6. Understand the implementation of recent advances in traffic engineering for the society benefits**.**

Unit 1.[10 Hrs]

Driver behaviour, traffic information and control systems Traffic studies- volume, speed and delay studies

Unit 2.[08 Hrs]

Elements of traffic flow theory ,Characteristics of uninterrupted traffic ,Capacity and LOS of ninterrupted facilities

Unit 3.08 Hrs]

Characteristics of interrupted traffic Traffic characteristics at un-signalized intersections Design of signalized intersections Capacity and LOS of signalized intersections

Unit 4.[08 Hrs]

Actuated signal control, signal coordination, Ramp Metering, Design of parking, lighting and terminal facilities

Unit 5.[08 Hrs]

Simulation of traffic systems, Trends in traffic engineering

Reference Books

1. Roger P. Roess, William R. McShane& Elena S. Prassas, Traffic Engineering, 4th Edition, Prentice-Hall, 2010
2. Fred Mannering, Walter Kileraski and Scott Washburn, Principles Of Highway Engineering And Traffic Analysis, 3rd Ed, Wiley India, 2007
3. L. R. Kadiyali, Traffic Engineering and Transportation Planning, Khanna Publishers, 2008.
4. Highway Capacity Manual 2000, MORTH Codes, All relevant IRC codes

TNSP423 TRAFFIC AND HIGHWAY ENGINEERING LABORATORY

Teaching Scheme				Credits	Evaluation Scheme						Total Marks
					Theory			Practical			
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	INT	EXT		
		02	02	01				25	25		50

1. Traffic inventory surveys – Classified Volume count surveys, Speed studies, Headway studies, Delay studies, Gap acceptance studies, Parking studies, Accident investigation studies
2. Road geometric design – Cross sectional elements design, Horizontal and vertical alignment design, Intersection design , Overview of MX roads
3. Pavement design for flexible and rigid pavements – Soil characterization, Pavement material characterization tests, Traffic characterization
4. Quality control and Quality assurance issues: Blending of aggregates, Job Mix formula design, Pre-construction, During construction and Post construction quality control tests
5. Traffic impact assessment on mixed land use environment

Reference Books

1. MORTH Specifications of Road Construction and Bridge Works
2. Ajay K. Duggal& Vijay Puri, Laboratory Manual in Highway Engineering, New Age International

TNSL551 ADVANCED HIGHWAY MATERIALS

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students will be able to:

1. Select the appropriate materials for use in different road layers.
2. To select appropriate binder for flexible pavement depending upon the traffic and climatic conditions
3. Determine the proportions of ingredients required for the mix design of both asphalt mixtures and cement concrete.
4. To carry out tests on cement and cement concrete
5. Demonstrate application of geosynthesis in pavements
6. Demonstrate application of waste materials in pavements

Unit-1.(8 Hrs)

Aggregate: Nature and properties – aggregate requirements – types and processing –aggregates for pavement base – aggregate for bituminous mixture – aggregate for Portland Cement Concrete – light weight aggregate – tests on aggregate – specification.

Unit-2.(8 Hrs)

Bituminous Materials: conventional and modified binders – production – types and grade –physical and chemical properties and uses – types of asphalt

pavement construction –principles of bituminous pavement construction – tests on bituminous materials. Bituminous

Unit-3. (6 Hrs)

Mix design – modified mixtures – temperature susceptibility and performance.Cement /concrete based materials: Cement – properties – PCC mix design and properties –modified PCC – Mix Design

Unit-4. (6 Hrs)

Behaviour – Performance – Tests on Cement and Concrete mixes. High Performance Concrete – low shrinkage – increased strength.Composites,

Unit-5. (6 Hrs)

Plastics and Geosynthetics: Plastics and polymerization process – properties –durability and chemical composition – Reinforced Polymer Composites – Geosynthetics –Dry Powdered Polymers – Enzymes.

Unit-6.(6 Hrs)

Reclamed/Recycled Waste Products: Reclaimed Materials – waste products in civil engineering applications – effect of waste products on materials, structure and properties –self healing and smart materials – locally available materials.

REFERENCE BOOKS:

1. P. T. Sherwood, *Alternative Materials in Road Construction*, Thomas Telford Publication, London, 1997.
2. RRL, DSIR, *Soil Mechanics for Road Engineers,* HMSO, London , 1995
3. Koerner, R. M. *Designing with Geosynthetics,* Prentice Hall, Englewood Cliffs, New Jersey, U.S.A.
4. Shan Somayaji, *Civil Engineering Materials*, second edition, Prentice Hall Inc., 2001.

TNSL552 TRANSPORTATION AND TRAFFIC INFRASTRUCTURE DESIGN

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Understand driver, vehicular and pavement surface characteristics.
2. Design road alignment manually and using MX road for hilly region
3. Design an intersection by considering advantages and disadvantages of each and every element of intersection
4. Design pedestrian facility and cycle tracks for road users.
5. Design different types of parking systems.
6. Understand the concept behind the runway design and railway alignment.

Unit1.[10Hrs]

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 2 :[10Hrs]

Horizontal Alignment and Vertical 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 and calculations , Introduction to MX Roads software ; Vertical Alignment : 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 3 : [10Hrs]

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.

Unit 4 :[10Hrs]

Miscellaneous Elements: Requirements of Pedestrians; 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 – Guidelines for lay out Design.; Design of Ramp

Unit 5 :[10Hrs]

Airport and Railway Infrastructure Design – Runway orientation, Site selection, Wind rose analysis Geometric design standards for runways, taxiways, aprons , Airport capacity analysis, Terminal design; GEOMETRIC DESIGN OF RAILWAY TRACK: Gradients- Grade Compensation- Cant and Negative Superelevation- Cant Deficiency – Degree of Curve – Crossings and Turn outs .

REFERENCE BOOKS:

1. Principles and Practice of Highway Engineering, L.R.Kadiyali and N.B.Lal, Khanna
2. Traffic Engineering and Transportation Planning, L.R.Kadiyali, Khanna Publications
3. Highway Engineering, C.E.G.Justo and S.K.Khanna, Nem Chand and Brothers.
4. IRC Codes for Signs, Markings and Mixed Traffic Control in Urban Areas.

TNSL553TRANSPORTATION SYSTEMS, ANALYSIS AND MODELLING

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students will be able to:

1. Optimize using classical methods and evolutionary algorithms for transportation system.
2. Design Route, Stop location for highway
3. Apply current practices for design of Transportation demand; Transportation models
4. Collect field data using different method and analyse it get key parameters for traffic study.
5. Calibrate the parameters using optimization techniques
6. Predict transportation system model using key parameters.

Unit1 (8HrS}

Introduction to optimization: classical methods and evolutionary algorithms;

Unit2 (8Hrs)

Transit systems: street transit systems, rapid transit systems and para-transit systems;

Unit3 (8Hrs)

Route development; Stop location and stopping policy; Schedule development; capacity of transit systems;

Unit 4 (8Hrs)

Transportation demand analysis; Transportation models;

Unit 4 (8Hrs)

Data collection and calibration of models.Essential Reading:

Reference Books-

1. L.R. Kadiyalli, Traffic Engineering and Transport Planning, Khanna Publishers, 7th edition, 2008.
2. V.R. Vuchic, Urban Transit Systems and Technology, John Wiley & Sons, 2007.
3. C.A.O'Flaherty, Transport Planning and Traffic Engineering, Arnold, 1997.
4. C. S. Papacostas, P. D. Prevedouros, Transportation Engineering and Planning, PHI Publication, 3rd Edition, 2002.
5. M.D. Meyer, E. J. Miller, Urban Transportation Planning, McGraw-Hill Book Company, 1984.
6. K. Deb, Multi-Objective Optimization using Evolutionary Algorithms, John Wiley & Sons, 2002.
7. H.A. Taha, Operations Research, Prentice Hall of India, 7th Edition, 2003.
8. Kanafani, Transportation Demand Analysis, McGraw-Hill Book Company

Elective II and Elective IIIi

TNSL554 ENVIRONMENTAL IMPACT ON VARIOUS TRANSPORTATION SYSTEM

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Understand the different aspects of impacts of different transportation system on environment
2. Perform cost benefit analysis of transportation facility.
3. Describe GIS applications, and clearance problems in India.
4. Different techniques to promote non-motorized transport systems.
5. Write a brief Environmental Impact Assessment report.
6. Study towards the reduction of noise and air pollution related to transportation systems.

Unit 1. (7Hrs}

Evolution of EIA; EIA at project; Regional and policy levels; Strategic EIA; EIA process; Screening and scoping Criteria; Rapid and comprehensive EIA;

Unit 2.(7Hrs}

Specialized areas like environmental health impact assessment; Environmental risk analysis; Economic valuation methods; Cost-benefit analysis;

Unit 3. (7Hrs}

Expert system and GIS applications; Uncertainties. Legislative and environmental clearance procedures in India and other countries Sitting criteria; CRZ;

Unit 4. (7Hrs}

Public participation; Resettlement and rehabilitation. Practical applications of EIA; EIAmethodologies;

Unit 5.(7Hrs}

Baseline data collection; Prediction and assessment of impacts on physical, biological andsocio-economic environment; Environmental management plan; Post project monitoring, EIA report and EIS; Review process.

Unit 6.(5Hrs}

Case studies on project, regional and sectoral EIA. Risk assessment fundamentals and methodology, case studies

Reference Books:

1. A.Chadwick, Introduction to Environmental Impact Assessment, Taylor & Francis, 2007.
2. Larry, W. Canter, Environmental Impact Assessment, McGraw Hill Inc. Singapore, 1996.
3. R.Therirvel, E. Wilson, S. Hompson, D. Heaney, D.Pritchard, Strategic Environmental Assessment
4. Earthscan, London, 1992.
5. A.Gilpin, Environmental Impact Assessment-Cutting edge for the 21st century, CUP, London, 1994.
6. Paul, A Erickson, A Practical Guide to Environmental Impact Assessment, Academic Press, 1994

TNSL555 TRANSPORTATION SAFETY AND MANAGEMENT

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Understand safety parameters for different transportation facilities.
2. Investigate the reasons of road crashes and respective counter-measures to reduce them.
3. Perform safety audits for transportation facilities at different levels of operation.
4. Design safety elements for pedestrians and cyclists.
5. Understand law enforcement methods to increase road traffic safety.
6. Prepare effective action report for risk management.

Unit 1. [08 Hrs]

Transportation Safety scenario in India and World, Accident Characteristics, Distribution among different modes. Need of Planning for Network, Land Use and Road Environment for Safety, Designing for Safety: Road Link Design, Junctions.Introduction to Road Safety Engineering and Crash Investigation, Human Factors Relating to Crashes/Accidents, Crash/Accident

Unit 2.[06 Hrs]

Investigation & Crash Problem Diagnosing, Crash Problems into Solutions & Crash, Investigation Reporting, Crash/Accident, Costing, Economic , Appraisal. Safety at Construction Site: Safety provisions for workers at construction site, Construction Zone markings, signs.

Unit 3. [08 Hrs]

Road Safety Auditing: An Introduction, Concept and need of Road Safety Audit (RSA). Procedures in RSA, design standards, audit tasks, stages of road safety audit, Road Safety Audit Types, key legal aspects, process, audit team and requirements, Checklist, how to use Checklists Road Safety inspection.

Unit 4.[06 Hrs]

Road design issues in RSA's. Overview of Road Safety Hazards. Report Writing including deficiency identification, corrective actions recommendations, prioritization. Structuring RSA report.Street Lighting & Traffic Signals, Provisions for NMT Vehicles in India, Safety Provisions for Pedestrians & Cyclists, Road Signs and Pavement Markings.

Unit 5. [07 Hrs]

Safe System Approach: A Global Perspective, Speed Management & safety, Safe System and Speed & Assessing speed limit, Type of speed limit & Speed zone signing Infrastructure to support safe speed feedback and enforcement.

Unit 6. [07 Hrs]

Hazard Identification and Management, Organizational commitment & encouraging RSA.Risk Assessment & Prioritization of audit recommendations, Solutions and effectiveness & Corrective, Action Report.

Reference Books

1. RuedigerLamm, Basil Psarianos, Theodor Mailaender, *Highway Design and Traffic Safety Engineering Handbook*, McGraw Hill Publishing, 1999
2. Road Safety Audit Manual

TNSL556 BRIDGE ENGINEERING

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Develop appropriate bridge solutions given site, geometric, functional and aesthetic constraints and drawing on other professional disciplines as required.
2. Complete detailed design of bridge structures in steel and concrete.
3. Assess the whole life costs of bridge structures.
4. Evaluate the substructures like pier, abutments, bridge slabs, etc
5. Understand the importance of bearings.
6. Construct and understand the maintenance parameters for bridges

Unit 1 [10 Hrs]

Components of Bridges – Classification – Importance of Bridges – Investigation for Bridges – Selection of Bridge site – Economical span – Location of piers and abutments – Subsoil exploration – Scour depth – Traffic projection – Choice of bridge type

Unit 2.[08 Hrs]

Specification of road bridges – width of carriageway – loads to be considered – dead load – IRC standard live load – Impact effect

Unit 3.[08 Hrs]

General design considerations – Design of culvert – Foot bridge - slab bridge – T-beam bridge –

Introduction to Pre-stressed concrete bridge, Box Culvert and Fly over bridges

Unit 4. [08 Hrs]

Evaluation of sub structures – Pier and abutments caps – Design of pier – Abutments – Type of foundations Importance of Bearings – Bearings for slab bridges – Bearings for girder bridges – Joints – Expansion joints

Unit 5. [08 Hrs]

Construction and Maintenance of bridges – Lessons from bridge failures

Reference Books

1. Ponnuswamy, S., *Bridge Engineering*, 2nd Edition, Tata McGraw - Hill, New Delhi, 2007
2. N. Rajagopalan, *Bridge Superstructure*, Narosa Publishing House, New Delhi, 2006.

TNSL557 ADVANCED TRAFFIC MANAGEMENT SYSTEM

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students will be able to:

1. Understand principles for design, management and control of operation of transport systems
2. Analyse various measure of effectiveness for a highway corridor
3. Modify intersection design to control various parameters like LOS and delay.
4. Investigate and analyse accidents for a system
5. Design traffic safety management system
6. Suggest a system with low cost traffic management techniques

Unit 1:[8Hrs]

Basic concepts of traffic characteristics: Speed, Volume and concentration – their basic relationship, Traffic measurement surveys like volume studies, speed studies, headway studies, delay studies, gap acceptance studies, intersection studies, travel time studies, accident studies, parking studies etc – Methods of computation, their presentation of data and analysis, Traffic studies for planning bypasses around towns

Unit2:[8Hrs]

Highway Corridor analysis: Traffic capacity analysis concepts, segment capacity, Queue delay, travel time sub period analysis, bus stop capacity for transit and highway corridors , performance measures.

Unit3:[8Hrs]

Intersection control and analysis: Roundabouts , Signal design- Methods, types, LOS and capacity determination, Uniform and incremental delay, Adjustment factors, Saturation flow rate, lane grouping analysis, signal coordination, signal controllers, ITS application and system architecture, timing plan design for pretimed control and traffic actuated control, queue accumulation polygons, coordinated semi actuated operation unsignalised intersection, 2 way Stop controlled intersection, LOS criteria, critical gap, potential and movement capacity, All way stop controlled intersection, overview with planning and designapplications

Unit4:[8Hrs]

Traffic safety Management : Accident investigation and analysis, Road accident collection and record system, Post accident reconstruction, Road safety auditing , Traffic impact analysis of landuse, Approaches to highway safety , Traffic calming measures , analysis of accident data and mathematical formulation , traffic control devices, Markings, Signs, Access management

Unit5:[8Hrs]

Transportation System Management:Guidelines for low cost traffic management techniques for urban areas – IRC Specifications, Advanced transit technologies, Bus route network planning and management

REFERENCE BOOKS:

1. Traffic Engineering by Roger P.Roess, William R. Mc. Shane, Elena S.Prassas , Prentice hall
2. IRC Codes
3. Traffic Engineering - Theory & Practice - Louis J.Pignataro, Prentice Hall Publication.
4. Principles of Highways Engineering and Traffic Analysis - Fred Mannering & Walter Kilareski, John Wiley & Sons Publication.
5. Transportation Engineering - An Introduction - C.JotinKhisty, Prentice Hall Publication Fff
6. Fundamentals of Transportation Engineering - C.S.Papacostas, Prentice Hall India.
7. I.T.E. Traffic Engineering Hand Book.
8. Fundamentals of Traffic Engineering – McShane& Rogers
9. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers
10. Metropolitan Transportation Planning, John W Dickey, Tata McGraw Hill

TNSL 558 COMMUNICATION STANDARDS USED IN TRANSPORTATION

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Understand the communicating standards and concept related to transportation engineering
2. Implement the communicating standards for development of transportation infrastructural planning
3. Understand the Manual simulation of simple queuing system
4. Learn to prepare report, event schaduling, create transactions, etc
5. Learn the application of GPSS
6. Solve the inventory problems in railway ports, level crossing, etc.

Unit1. [10Hrs]

Introduction to systems approach - Typical transportation systems - Mathematical models.Fundamentals of simulation - Monte Carlo method - Analog and digital simulation -Continuous

and discrete models - Simulation languages - Introduction to CSMP.

Unit2. [10Hrs]

Probability concepts - Random numbers - Pseudo random generators - Arrival patterns -Service time distributions, Queue discipline – Manual simulation of simple queuing system

Unit3.[10Hrs]

Creating and moving transactions - Queues and facilities - Event scheduling - Internal logic of GPSS processor - Program control statements. Priority - Preemption - Functions – Parameters and save values – Standard numerical attributes - Collection of statistics - Report preparation.

Unit4.[10Hrs]

Applications of GPSS - Simple queuing problems - Inventory problems - Simulation of ports - Railway platforms and level crossings - Traffic signals. Analysis of simulation results - Model validation - Replication of random conditions - Time series analysis.

Reference Books-

1. Gordon, G., System Simulation, Prentice-Hall of India, 1992
2. GPSS/PC, User Manual, Minuteman Software, USA, 1985

TNSL559 TRANSPORTATION NETWORK ANALYSIS

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students will be able to:

1. Simulate new ways of thinking about the dynamics of network development.
2. Enhance the ability to draw implications of alternative policies on transportation network form
3. Develop understanding of transportation network development process, the influencing factors and players.
4. Understand travel demand modeling process
5. Do minimum cost network assignment
6. Do the analysis using computer software like TRIPS, SATURN, EMME/2, CUBE, etc.

Unit1.[8Hrs]

Network flows: Applications, definitions, graphs, paths, trees, cycles, loops, walk, network representation (adjacency list and matrices) and basic network transformations; Network algorithms; Complexity, Search Algorithms, Strategies for designing polynomial algorithms.

Unit2..[8Hrs

Shortest Path Algorithms: Label setting, Dijkstra's and Dial's algorithms, Optimality conditions, label correcting algorithms and optimality conditions, detecting negative cycles,all-pair shortest path algorithms; pre-flow push polynomial time algorithms, capacity scaling techniques.

Unit3..[8Hrs

Minimum cost network assignment: optimality conditions, cycle-canceling algorithm,Successive shortest path algorithm, other polynomial time variants; Network equilibrium analysis; principles and optimisation formulations, Frank-Wolfe algorithm; Special cases and variants.

Unit4..[8Hrs

Applications: Applications of min-cost, max-flow, and shortest path algorithms to transportation and infrastructure networks: transportation networks, airline, freight, facility location, logistics, network design, project scheduling, reliability of distribution systems,telecommunication/power networks etc.

Unit5..[8Hrs

Computer Software: Principles of TRIPS, SATURN, EMME/2, CUBE; Demo Versions, Case studies

Reference Books-

1. Ahuja, R.., Magnanti, T.L., and Orlin, J.B., Network Flows: Theory, Algorithms and Application, Prentice Hall, New Jersey, 1993.
2. Bell, M.G., Transportation Networks, Elsevier Science Publishers, 1999.

TNSL560GROUND IMPROVEMENT TECHNIQUES

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Understand basic principles of various ground improvement techniques.
2. To demonstrate the use of verticle draining
3. Understand the significance of various ground improvement techniques in Highway engineering.
4. To demostrate various premixing method used in Hoghway Engineering
5. Understand principle Grounting Technique
6. Understand in-sit method of ground reinforcement

Unit 1: . [7Hrs)

INTRODUCTION-Introduction, Need for Ground Improvement, Classification of ground Improvement Techniques

MECHANICAL MODIFICATIONS-Introduction, Terminology,Methods of Compactions , Principles of Soil Compaction, Properties of Compaction Soil, Compaction Control Tests , Dynamic Compaction , Liquefaction of Soil and its Remedial Measures ,Expansive Soil and its Remedy

Unit 2: . [7Hrs)

PRELOADING AND THE USE OF VERTICAL DRAINS-Need for Preloading, Preloading without

Vertical Drains, Preloading with Vertical Drains, Effect of Smear, Assessment of Ground Conditions
Unit3: . [7Hrs)
GEOSYNTHETICS-Introduction, Function of Geosynthetics, Selection of Geosynthetics, Application Areas, Design of Geotextiles, Design of Geogrids, Design of Geonets, Design of Geomembranes,
Unit4: . [7Hrs)
THE PREMIXING METHOD-Introduction, Factors Influencing the Increase in Strength , Engineering Properties of Treated Soil , Design Methods
Unit5: . [7Hrs)
MODIFICATION BY GROUTING-Introduction, Categories of Grouting, Grout Materials, Grouting with Cement , Jet Grouting , Compaction Grouting , Chemical Grouts, Grouting Theory, Grouting Technology, Field Equipment, Applications of Grouting ,
Unit6: . [5Hrs)
IN-SITU GROUND REINFORCEMENT
Introduction, Ground Anchors , Rock Blots , Soil Nailing , Elastic Models of Soil behavior

REFERENCE BOOKS-

1. Hausmann, M.R., Engineering Principles of Ground Modification, McGraw – Hill International Editions,1990.
2. Purushotham Raj, Ground Improvement Techniques, Laxmi Publications, New Delhi
3. Sharma.S.K.,Priniciples, Practice and Design of Highway Engineering, S.Chand& Co. New Delhi,1985.
4. Jones C. J. F. P, Earth Reinforcement and Soil Structures, Butterworths, London.

SEMESTER- II

TNSL424 TRAFFIC FLOW THEORY

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Understand aspects of measurement, statistical distributions, models, information processing, noise and simulations.
2. Develop the application /various methods of measurement currently available to the traffic flow characteristics..
3. Understand, delays at intersections and unsignalized intersections.
4. Understand the car flollowing models and its analysis
5. Conduct the queuing analysis at different location on different road networks
6. Perform simulation of traffic flow by digital computers in detail.

Unit 1. [8Hrs]
Traffic stream parameters - Fundamental diagram of volume-speed-density surface.Discrete and continuous probability distributions.Merging maneuvers - critical gaps and their distribution.

Unit 2. [08 Hrs]
Macroscopic models - Heat flow and fluid flow analogies - Shock waves and bottleneck control approach.

Unit 3 [08 Hrs]
Microscopic models - Application of queuing theory - regular, random and Erlang arrival and service time distributions - Waiting time in single channel queues and extension to multiple channels.

Unit 4. [08 Hrs]
Linear and non-linear car following models - Determination of car following variables

Unit 5.[08 Hrs]
Modeling Signalized Intersections,Simulation and Modeling

Reference Books

1. TRB,Revised Monograph on Traffic Flow Theory, 2001.
2. Adolf May, Traffic Flow Fundamentals
3. Carlos F. Daganzo, Fundamentals of Transportation and Traffic Operations, Pergamon, 1997

TNSL426 INTELLIGENT TRANSPORTATION SYSTEMS

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

1. Understand the role of ITS and understand policy conflicts and where technology solutions have succeeded and failed.
2. Develop ability to assess how technology solutions can be used to deliver a transport policy or address a transport problem
3. Learn the travel and traffic management, public transportation management
4. learn the ITS data collection techniques
5. Learn Advance Vehicle Safety System
6. Learn the application of ITS

Unit 1 [08 Hrs]
Introduction to Intelligent Transportation Systems (ITS) – Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI),

Geographic Information Systems (GIS), video data collection.

Unit 2. [08 Hrs]

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

Unit 3. [08 Hrs]

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

Unit 4. [08 Hrs]

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

Unit 5. [08 Hrs]

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.Case Studies in India.

Reference Books

1. Sussman, J. M., Perspective on ITS, Artech House Publishers, 2005.
2. National ITS Architecture Documentation, US Department of Transportation, 2007

TNSP427 Transportation System Software Laboratory

Teaching Scheme				Credits	Evaluation Scheme					
					Theory			Practical		Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	INT	EXT	
		02	02	01				25	25	50

Data processing and graphical presentation using ms excel & access:

Creation of Data Processing Templates, Usage of standard functions, Statistical Analysis, Macros, Graphical Presentation of Data.

Basics of AutoCAD: 2D Drawing and Advance Features, Modeling and Imaging in 3D

Use of MXROAD.Traffic Simulation using TSIS 5.0, VISSIM etc.Introduction to TransCAD.

Project Design

Project Design related to traffic and highway engineering.

Reference Books

1. Thomas A. Stellman, G. V. Krishnan, Harnessing AutoCAD, AutoDesk Progress.
2. TSIS 5.0 User Guide

ELECTIVE – IV, ELECTIVE – VI AND ELECTIVE – VI

(SELECT THREE DIFFERENT SUBJECTS AS ELECTIVE IV , ELECTIVE IV AND ELECTIVE VI)

TNSL561TRANSDUCERS AND SENSORS

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. To demonstrate various measurement technique for traffic measurement
2. Design and operation of resistive transducer
3. Design and operation of Inductive and resistive transducer
4. Understand the use of various sensors for traffic engineering purpose
5. Understand hall effect and Radiation sensors
6. Understand the application of communication technologies in transportation

Unit 1 [07 Hrs]

Science of Measurement: Measurement systems – methods of measurement-direct-deflection and null type, definition of sensor/transducer-classification of sensors/transducers-selection criteria-static characteristics-dynamic characteristics

Unit 2. [07 Hrs]

Resistive transducers: Resistance potentiometer-loading effect-strain gauges-gauge factor-types of strain gauges-rosettes-resistance thermometers-construction,characteristics- thermistors-thermocouples-thermowells- hot wire anemometer-constant current and constant temperature operation.

Unit 3. [07 Hrs]

Inductive and capacitive transducers: Basic principle-self-inductance- mutual inductance, LVDT -signal conditioning Unit-methods of null reduction- RVDT-synchros-induction potentiometer-variable reluctance transducer.

Unit 4. [07 Hrs]

Capacitive transducers: Introduction-Variable area type-variable air gap type-variable permittivity type-capacitive level sensor-capacitor microphone-frequency response.

Unit 5. [07 Hrs]

Piezoelectric, Hall Effect and Radiation Sensors: Introduction of piezoelectricity-piezoelectric crystals-

accelerometer-charge amplifier-Hall Effect transducers-introduction- applications. Basic characteristics of Radiation Sensors-types ofphotodetectors-photoemissive cell-photovoltaic cell-photo conductive cell-LDR.

Unit 6. (07 Hrs]

Digital and Smart Sensors: Introduction to fiber-optic sensors-temperature sensors-liquid level sensing-fluid flow sensing-Microbend sensors.

Digital SensorsIntroduction to digital encoding transducer- classification-digital displacement transducers- shaft encoder-optical encoder; Smart Sensors: Introduction-primary sensors-excitation-amplification-filters-compensation-thin film sensors.

Reference Books

1. Measurement Systems, Application and design, E.O. Doeblin, Tata McGraw Hill, 2004.
2. Transducers and Instrumentation, D.V.S.Murthy, PHI, 1995.
3. Sensors and Transducers, D.Patranabis, PHI, 2004.

TNSL562 SOFT COMPUTING

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Perform analysis using computing data for transportation planning and design
2. Implement the knowledge for transportation simulation through various processing methods
3. Apply Artifical Neural Network for Transportation Planning and Management
4. Apply Fuzzy Logic and do fuzzy modelling for Transportation Planning and Management
5. Apply fundamentals of genetic algorithm for Transportation Planning and Management
6. Apply swarm intelligence technique for Transportation Planning and Management

Unit 1.[10Hrs]

Neural Networks: Introduction to Biological Neural Networks : Neuron physiology, Neuronal diversity, specification of the brain, the eye's Neural Network.Artificial Neural Network Concepts: Neural attributes, Modeling learning in ANN, characteristics of ANN, ANN topologies, learning algorithm.

Unit 2. [08Hrs]

Neural Network Paradigm: MeCulloch-Pitts, Model, the perception, Back-propagation networks. Associative Memory, Adaptive Resonance (ART) paradigm, Hopfield Model, Competitive learning Model, Kohonen Self-Organizing Network.

Unit 3. [08Hrs]

Fuzzy Logic: Introduction to Fuzzy sets: Fuzzy set theory Vs Probability Theory, classical set theory, properties of Fuzzy sets, Operation on Fuzzy sets. Fuzzy relations, Operations of Fuzzy relation, the extension principle. Fuzzy Arithmetic, Approximate reasoning: Introduction, linguistic variables, Fuzzy proposition, Fuzzy if-then rules.Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

Unit 4.[08Hrs]

Genetic Algorithms: Fundamentals of Genetic Algorithms. Encoding, Fitness function, Reproduction, Genetic modeling: Cross over, Inversion & Deletion, Mutation Operator, Bit wise Operators, Convergence of Genetic Algorithm

Unit 5.[08Hrs]

Swarm Intelligence: Introduction to swarm intelligence and key principles (e.g. self organization, stigmergy), neural and artificial examples, Computaional and embedded SI, Foraging, trail laying, Open space, multi source foraging experiments: biological data, microscopic experiments.Ant-Colony Optimization, Recent trends in soft computing

Reference Books

1. Introduction to Artificial Neural Systems: Jacek M. Zurada, Jaico Publishing House
2. Fuzzy sets & fuzzy logic, George J Klir, B. Yuan, PHI
3. Neural Network, Fuzzy Logic and Genetic Algorithm, S. Rajshekahran, G.A. VijaylaxmiPai, PHI
4. "Swarm Intelligence: From Natural to Artificial Systems", E. Bonabeau, M. Dorigo, and G. Theraulaz, Santa Fe Studies in the Sciences of Complexity, Oxford University Press, 1999.

TNSL563 URBAN TRANSPORTATION PLANNING

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Understand the concept and scenario of urban transportation
2. Determine contemporary issues and approaches in, urban transport planning and policy-making.
3. Carry out transport modeling, to plan road networks and public transport
4. To develop a policy framework in which demand management, traffic management and traffic calming approaches and techniques can be implemented.
5. To discuss transport policies and strategies for sustainable cities.
6. understand the different modes of transportation and their interdependency

Unit 1. [10 Hrs]

Introduction to transportation planning; Systems approach to transportation planning; Types of models;

Unit 2. [08 Hrs]
Concept of travel demand and supply; Socio-economic, land use, network, and transport system characteristics affecting transportation planning;
Unit 3.[08 Hrs]
Study area definition, zoning principles, cordon and screen lines, data collection through primaryand secondary sources, sampling techniques;Four-stage sequential modelling approach; trip generation; trip distribution; modal split; trip assignment; land use-transport models;
Unit 4. [08 Hrs]
Activity-Based Modeling,Urban Good Movement
Unit 5. [08 Hrs]
Planning for Non-motorized vehicles.Public transport planning, integration of different modes; Travel demand management

Reference Books

1. C.J. Khisty and B.K. Lall, *Trans*portation Engineering – An Introduction, Prentice Hall of India Pvt. Ltd., 2003.
2. Juan De Dios Ort, Luis G Willumsen, and Juan De Dios Ortuzar, Modeling Transport, John Wiley and Sons, 2011
3. Michael Meyer and Eric J. Miller, Urban Transportation Planning, 2nd Edition, McGraw-Hill Publications, 2000.
4. C. S. Papacostas and P. D. Prevedouros, Transportation Engineering and Planning, 3rd Edition, Prentice-Hall, 2000

TNSL564 COMPUTER AIDED TRANSPORTATION ENGINEERING

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes:
On successful completion of the course, student shall be able to:
1. Analyze and design the flexible & rigid pavements
2. Design different geometric parameters like superelevation, horizontal curves, vertical curves suing softwares
3. Use the simulation software for visualizing the different traffic flow measures before they are adopted.
4. Use different softwares for designing the transportation systems
5. Use different softwares for its application in transportation planning
6. Perform statistical analysis of transportation parameters using softwares

Unit-I : [08Hrs]
Introduction to software; Synchro 8, SimTraffic**Unit-II** :[08Hrs]
Analysis and Design of flexible pavement using software, Analysis and Design of concrete pavement usingsoftware,
Unit-III : [08Hrs]
Design of horizontal curve, vertical curve and superelevation using software (MX-ROAD), Design of intersections, rotaries and inter changes using software (MX-ROAD), Traffic flow simulation using software
Unit-IV : [08Hrs]
(CUBE), Planning of transportation systems using software (TransCAD), Statistical analysis softwares, e.g. SPSS, SAS, Statistic

Reference Books

1. Gordon, G., System Simulation, Prentice-Hall of India, 1992
2. GPSS/PC, User Manual, Minuteman Software, USA, 1985

TNSL565 HIGHWAY TRAFFIC ANALYSIS AND DESIGN

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes
After the course students will be able to:
1. Apply concepts of Vehicle characteristics and IRC standards
2. Implement Traffic regulation and control - Signs and markings - Traffic System Management.
3. Use statistical techniques for Horizontal curves - Vertical curves.
4. Design of signal setting - phase diagrams, timing diagram – Signal co-ordination.
5. Understand the concept of street lighting and road furniture.
6. Perform road safety audit.

Unit1.[08Hrs]
Elements of Traffic Engineering - road user, vehicle and road way. Vehicle characteristics -IRC standards - Design speed, volume. Highway capacity and levels of service - capacity of urban and rural roads.
Unit2. [08Hrs]
PCU concept and its limitations - Road user facilities – Parking facilities - Cycle tracks and cycleways - Pedestrian facilities.Traffic volume studies, origin destination studies, speed studies, travel time and delay studies,
Unit3. [08Hrs]
Parking studies, Accident studies.Elements of design - Alignment - Cross sectional elements - Stopping and passing sight distance. Horizontal curves - Vertical curves. Design problems – Hill Roads.
Unit4.[08Hrs]
Traffic regulation and control - Signs and markings - Traffic System Management - Design of at-grade intersections – Principles of design – Channelisation - Design of rotaries – Traffic signals - pre-timed and traffic actuated. Design of signal setting - phase

diagrams, timing diagram – Signal co-ordination.
Unit5. [08Hrs]
Grade separated intersections - Geometric elements for divided and access controlled highways and expressways – Road furniture - Street lighting. Traffic Safety – Principles and Practices – Road Safety Audit.

References-

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

TNSL566 TRANSPORTATION ECONOMICS AND FINANCE

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes
1. Perform cost analysis for highway and road facilities
2. Understand concepts and methods of auditing transportation safety and economics.
3. Learn the supply and demand in transport system
4. Analyses the project economy
5. Learn to finance road projects
6. Learn the method of risk analysis

Unit 1[08Hrs]
Motor Vehicles Act - statutory provision for road transport and connected organisations. Route scheduling, Freight transport, Vehicle scheduling, Optimum fleet size, Headway control strategies, Crew scheduling.
Unit-2. [08Hrs]
Depots and Terminals - Principles and types of layout, Depot location, Twin depot concept, Crew facilities. Design of parking facilities – Bus terminal, bus stops and bus bays
Unit-3. [08Hrs]
Transportation costs - Supply and demand - elasticity of demand; Supply of transport services - Economics of traffic congestion - Pricing policy. Vehicle operating costs – Fuel costs - Maintenance and spares - Depreciation - Crew costs - Value of travel time savings -Accident costs.
Unit-4 [08Hrs]
Economic analysis of projects - Methods of evaluation - Cost-benefit ratio, first year rate of return, net present value, and internal-rate of return methods; Indirect costs and benefits of transport projects.
Unit-5 [08Hrs]
Financing of road projects - methods – Private Public Partnership (PPP) - Toll collection - Economic viability of Build-Operate-Transfer Schemes – Risk Analysis - Case Studies.

Reference Books

1. CRRI, Road User Cost Study in India, New Delhi, 1982
2. PPP documents of Planning Commission of India
3. Kenneth J. Button, Transportation Economics, 2nd Edition, Edward Elgar Pub, 1993
4. IRC, Manual on Economic Evaluation of Highway Projects in India, SP30, 2007

TNSL567PUBLIC TRANSPORTATION PLANNING AND DESIGN

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes
Upon successful completion of the course, students will be able to:
1. To understand public transport planning inputs and data required for transit line headway determination and timetable development.
2. Utilize mathematical models for predicting passenger demands and assessing the impacts of alternative public transport improvement measures
3. Apply optimization and analytical techniques for resource allocation and transit network design problems
4. Exercise professional judgment and engineering sense in design and evaluation of public transit improvement measures.
5. use knowledge of the case studies referred in real world.
6. carry out swot analysis of integrated transportation planning

Unit 1.[12Hrs]
Modes of public transportation and application of each to urban travel needs; comparison of transit modes and selection of technology for transit service; transit planning,
Unit 2. [10Hrs]
Estimating demand in transit planning studies, demand modeling, development of generalized cost, RP & SP data and analysis techniques; functional design and costing of transit routes, models for planning of transit routes, scheduling; management and operations of transit systems;
Unit 3. [08Hrs]
Integrated public transport planning; operational, institutional, and physical integration; models for integrated planning;
Unit 4. [10Hrs]
Case studies.

Reference Books

1. VuchicVukan R., Urban Transit: Operations, Planning and Economics, Prentice Hall, 2005.
2. Gray G. E., and Hoel L. A., Public Transportation, Prentice Hall, 1992.
3. Tyler N., Accessibility and the Bus System – Concepts and Practice, Thomas Telford, 2002.
4. Tiwari G., Urban Transport for Growing Cities – High Capacity Bus System, MacMillan India Ltd., 2002.
5. Intermediate Public Transport Manuals.

TNSL568RAILWAY INFRASTRUCTURE PLANNING AND DESIGN

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students will be able to:

1. To learn the Railway track components.
2. To Understand planning and standards for design the track ,
3. Apply current practices for Metrorail and monorail development.
4. Understand important features of railway curves
5. Modernize the railways according to future trends
6. Have knowledge of track standards and track rehabilitation

Unit 1 (10Hrs)

Track and track stresses, Train resistances and hauling power of locomotives ; Railway track components:

Unit2 (10Hrs)

Important features, Railway curves, Superelevation, Gradients and grade compensation,

Unit 3 (10Hrs)

Points and crossing and their design approaches. ; Construction and maintenance of railway track, Control of train movements;

Unit4 (10Hrs)

Signals and interlocking, Modernization of railways and future trends; Track standards and track rehabilitation.

Reference books:

1. J.S. Mundrey, Railway Track Engineering, Tata McGraw Hill Co. Ltd., 3rd Edition, 2000.
2. M.M. Agarwal, Railway Track Engineering, Standard Publishers, 1st Ed. 2005.
3. S. Chandra and Aqarwal, Railway Engineering, Oxford University Press, 1st Ed. Feb 2008.
4. A.D. Kerr, Fundamentals of Railway Track Engineering, Simmons Boardman Pub Co (December 30, 2003)

TNSL569WATERWAY INFRASTRUCTURE PLANNING AND DESIGN

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students will be able to:

1. Understand various water transportation modes
2. Understand the port management and operations.
3. To learn the planning and design of ports and terminals
4. To develop the application of Offshore Structures, Simulation modeling, analytical solutions.
5. To understand Physical planning, location and orientation of major port components, access channels, basins, breakwaters
6. Understand the organization, management and operations, functions of port authority and basicoperational principles.

Unit 1[08Hrs]

Ship characteristics and their influence on ports management and operations. Civil engineers concern about ships and shipbuilding,

Unit 2. [08Hrs]

Syncrolift equipment in ports (General definition consideration and aspects in planning and design of ports and terminals)

Unit 3 [08Hrs]

Physical planning, location and orientation of major port components, access channels, basins, breakwaters, wharfs, quays piers, jetties, fendors.

Unit 4. [08Hrs]

Offshore Structures,Simulation modeling, analytical solutions, Cargo handling systems, economic feasibility, evaluation, economic costs and benefits, least cost solutions.

Unit 5.[08Hrs]

Organization, management and operation, function of port authorities, O and M, MIS, basic operational principles.

Reference Books

1. Aegerschou, Lundgren et. al., Planning, Designing of Port and Marine Terminals, John Wiley and Sons, 1983.
2. Port Engineering and Operations: Proc. Conference of British Ports, New Castle upon Tynes, March, 1985, Thomas Telford, London, 1985.
3. Hennes and Eske, Fundamentals of Transportation Engineering, McGraw-Hill Book Co., 1955.

TNSL570 AIRPORT PLANNING AND DESIGN

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students will be able to:

1. Assess the issues relating to regulation and deregulation of airport
2. Understand airport master planning, standards, airport facilities, terminal planning, functions and operations.
3. Apply current practices for airport development.
4. Adopt design principles for critical, semi critical and non-critical pavements
5. Plan & design airport hangars
6. Provide proper guidelines regarding the amenities to be required at airport terminals

Unit1 (10Hrs)
Classification of airports- ICAO standards ; Planning for airport- Airport components- Zoning laws ; Runways orientation and geometric
Unit2 (10Hrs)
design- Runway patterns ; Taxiways- alignment- geometry and turning radius- exit taxiways ; Aprons- planning and design ; Design principles of critical, semi-critical, non-critical airport pavements-
Unit3 (10Hrs)
FAA and PCA methods ; Airport hangars- their planning and design criteria ; Airport landscaping, grading and drainage- general aspects ;
Unit4 (10Hrs)
Airport terminal and amenities ; Airport lighting and marking.

Reference Books:

1. N.J. Ashford, P.H. Wright, Airport Engineering, 3rd Edition, 1992, John Wiley
2. R.M. Horonjeff, F.X. McKelvey, W.J Sproule, Seth Young, Planning and Design of Airports, TMH International Publishers, Fifth Edition, 2009
3. Khanna, Arora and Jain, Planning and Design of Airports, Nemchand Bros., 2001
4. Wells, Alexander; Young, Seth, Airport Planning & Management, McGraw Hill,5th Edition, July,2009
5. De N. Richard, &Odoni, Airport Systems: Planning, Design, and Management, McGraw Hill Amedeo, 1st
6. Edition, 2004.

TNSL571 GIS AND REMOTE SENSING

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

COURSE OUTCOME

After the course students will be able to:

1. Define GIS, type of data and data structure and learn history of GIS
2. Apply various commands for spacialanaysis such as query, overlay and data analysis
3. Understand the aplications of GIS and basic concepts of photogrammetry
4. To learn the concept of remote sensing , element , passive and active remote sensing
5. To understand GIS/GPS in Transportation, Real World Experiences
6. To Learn application of GIS/GIS map in transportation engineering

Unit 1. (7Hrs)
GIS Definition – Map and map analysis – Automated cartography – History and development of GIS – Hardware requirement – Type of data – Spatial and non- spatial data – Data structure – Vector and raster – Files and data formats – Data compression.
Unit 2.. (7Hrs)
Spatial analysis – Data retrieval – Query – Overlay – Vector data analysis – Raster data
analysis – Modelling in GIS – Digital Elevation Model – DTM – Types of output data –
Output devices – Sources of errors – Types of errors – Elimination – Accuracies –
Unit 3.. (7Hrs)
The Global Positioning system and its applications. Concepts and foundations of remote sensing - electromagnetic spectrum - EMR interaction with atmosphere, water vapour, ozone - Basic principles of photogrammetry – Spectral Signature and Spectral Signature curves –
Unit 4.. (7Hrs)
Remote sensing platforms and sensors.Satellite system parameters, sensor parameters, earth resources and meteorological satellites,microwave sensors, Data Acquisition and interpretation - Visual Image Interpretation – Visual Image Interpretation Equipment –
Unit 5.. (7Hrs)
Digital Image Processing – Classification.Applications in Survey, mapping and monitoring of land use/land cover –
Unit 6.. (5Hrs)
Transportation planning - Infrastructure development - Natural resources management - Urban Planning,Environment - Coastal Zone Management – Air Quality - Development of Resources Information Systems.

Reference Books-

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

TNSL572 PAVEMENT DESIGN AND ANALYSIS

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	

3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students will be able to:

1. To enable students to understand and differentiate between road pavement structures or layers
2. To understand the different design criteria for flexible pavement
3. Design a flexible pavement using IRC, Asphalt Institute, and AASHTO methods.
4. Design a rigid pavement using IRC, and AASHTO methods
5. Select maintenance technique depending upon the intensity of the distresses
6. Evaluate the pavements based on the functional and structural characteristics

Unit1. [08Hrs]

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

Unit2. [08Hrs]

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

Unit3. [08Hrs]

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

Unit4. [08Hrs]

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

Unit5. [08Hrs]

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

Reference Books.

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

TNSL573PROJECT MANAGEMENT

Teaching Scheme	Credits	Evaluation Scheme		
		Theory	Practical	Total

Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	Marks
3	0	-	3	3	20	30	50	--	100

Course Outcomes:

After successful completion of this course the students will be able to:

1. understand the concept of project life cycle and factors affecting the project life cycle
2. Solve problems related to network and total duration of the project using different network techniques.
3. Prepare capital budget, estimate cost of capital, develop capital structure and allocate resources.
4. Develop an understanding and ability to use basic business financial management concepts in the context of project execution.
5. Analyse and periodically monitor Financial performance of Project.
6. Understand short term and long term financial policies for business and relate capital investment decisions to project performance.

Unit-1.[08Hrs)

Introduction: Foundations of Project Management, Project Life Cycle, The Project Environment, Project Selection, Project Proposal, Project Scope, Work Breakdown Structure.

Unit-2..[08Hrs)

Network Scheduling, Critical Path Method, Program Evaluation AND Review Technique, Planning and Scheduling of Activity Networks, Assumptions in PERT Modelling, Time-cost Trade-offs, Linear Programming and Network Flow Formulations, PERT/COST Accounting. Scheduling with limited resources, Resource Planning, Resource Allocation,

Unit-3.[08Hrs)

Project Schedule Compression, Project Scheduling Software, Precedence Diagrams, Decision CPM,

Unit-4.[08Hrs)

Generalized Activity Networks, GERT. Estimation of Project Costs, Earned Value Analysis,

Unit-5..[08Hrs)

Monitoring Project Progress, Project Appraisal and Selection, Recent Trends in Project

Reference Books

1. Projects: Planning, Analysis, Selection, Implementation AND Review, Prasanna Chandra, 5th Ed., 2002. •
2. Project Management: A systems approach to planning and controlling, Harold Kerzner, CBS Publisher, New Delhi, 2nd Ed., 2000.

THIRD SEMESTER

TNSP574 - Industry project/ Research Project (Phase-I)

Teaching Scheme				Credits	Evaluation Scheme					
					Theory			Practical		Total Marks
Th	Tu	Pr	Total Ho		TAE	CAE	ESE	INT	EXT	

			urs							
		09	09	09				150		150

Course Objectives :

1. To develop the ability to analyze and use scientific approach in solving complex engineering problems.
2. To develop an attitude of continuous and lifelong learning
3. To develop oral and written communication and presentation skills, critical review of the existing literature.
4. To develop design skills and the ability to conduct planned experimentation.

Course Outcomes:

1. Upon successful completion of phase –I of dissertation, students shall be able to:
2. Analyze complex engineering problems, develop action plan and apply appropriate research methodologies to find workable solution.
3. Develop oral and written communication and presentation skills, critical review of the existing literature, experimental and design skills
4. Develop an attitude of continuous and lifelong learning

- **FOURTH SEMESTER**

Teaching Scheme				Credits	Evaluation Scheme					
					Theory			Practical		Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	INT	EXT	
		15	15	15				150	150	300

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TNSP 543- Industry project/ Research Project (Phase-II)

Course Objectives :

1. To develop the ability and skill sets to analyze and solve complex engineering problems, independently or as a team member, using modern tools and computational techniques.
2. To develop oral and written communication and presentation skills, critical review of the existing literature, experimental and design skills
3. To develop an attitude of continuous and lifelong learning

Course Outcomes:

Upon successful completion of the dissertation, students will be able to:

1. Analyze and solve a complex engineering problem posed for investigative study, independently or as a team member, using modern tools and computational techniques.
2. Develop oral and written communication and presentation skills, critical review of the existing literature, experimental and design skills and showcase research findings through publications.
3. Develop an attitude of continuous and lifelong learning.