UNIVERSITY DEPARTMENTS

ANNA UNIVERSITY CHENNAI : : CHENNAI 600 025

REGULATIONS - 2009

CURRICULUM I TO IV SEMESTERS (FULL TIME)

M.E. TRANSPORTATION ENGINEERING

SEMESTER I

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	TE9101	Transportation Systems Planning	3	0	0	3
2	TE9102	Traffic Engineering and Management	3	0	0	3
3	TE9103	Pavement Materials and Construction	3	0	0	3
4	TE9104	Urban and Regional Development	3	0	0	3
5	E1	Elective I	3	0	0	3
PRACTICAL						
6	TE9105	Pavement Materials Lab	0	0	4	2
7	TE9106	Traffic Surveys and Analyses	0	0	4	2
		TOTAL	**15**	**0**	**8**	**19**

SEMESTER II

SL No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	TE9121	Bus and Rail Transit System Planning	3	0	0	3
2	TE9122	Transportation Modeling and Simulation	3	0	0	3
3	TE9123	Pavement Analysis, Design and Evaluation	3	0	0	3
4	TE9124	Quantitative Techniques for Transportation Engineering	3	0	0	3
5	TE9125	Seminar	0	0	3	1
6		Elective II	3	0	0	3
PRACTICAL						
7	TE9126	Pavement Evaluation Lab	0	0	4	2
8	TE9127	Transportation Projects – Field Studies	0	0	4	2
		TOTAL	**15**	**0**	**11**	**20**

SEMESTER III

SL No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	TE9131	Transport Economics	3	0	0	3
2	TE9132	Traffic Flow Theory	3	0	0	3
3	E3	Elective III	3	0	0	3
PRACTICAL						
4	TE9133	Practical Training (4 Weeks)	0	0	0	1
5	TE9134	Project Work Phase I	0	0	6	3
		TOTAL	**9**	**0**	**6**	**13**

SEMESTER IV

SL No	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1	TE9141	Project Work Phase II	0	0	30	15
		TOTAL	**0**	**0**	**30**	**15**

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE = 67

UNIVERSITY DEPARTMENTS

ANNA UNIVERSITY CHENNAI : : CHENNAI 600 025

REGULATIONS - 2009

CURRICULUM I TO VI SEMESTERS (PART TIME)

M.E. TRANSPORTATION ENGINEERING

SEMESTER I

SL No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	TE9101	Transportation Systems Planning	3	0	0	3
2	TE9102	Traffic Engineering and Management	3	0	0	3
3	TE9104	Urban and Regional Development	3	0	0	3
PRACTICAL						
4	TE9106	Traffic Surveys and Analyses	0	0	4	2
		TOTAL	**9**	**0**	**4**	**11**

SEMESTER II

SL No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	TE9121	Bus and Rail Transit System Planning	3	0	0	3
2	TE9122	Transportation Modeling and Simulation	3	0	0	3
3	TE9124	Quantitative Techniques for Transportation Engineering	3	0	0	3
PRACTICAL						
4	TE9127	Transportation Projects – Field Studies	0	0	4	2
		TOTAL	**9**	**0**	**4**	**11**

SEMESTER III

SL No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	TE9103	Pavement Materials and Construction	3	0	0	3
2	E1	Elective I	3	0	0	3
PRACTICAL						
3	TE9105	Pavement Materials Lab	0	0	4	2
		TOTAL	**6**	**0**	**4**	**8**

SEMESTER IV

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	TE9123	Pavement Analysis, Design and Evaluation	3	0	0	3
2	TE9125	Seminar	0	0	3	1
3	E2	Elective II	3	0	0	3
PRACTICAL						
4	TE9126	Pavement Evaluation Lab	0	0	4	2
		TOTAL	**6**	**0**	**7**	**9**

SEMESTER V

SL No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	TE9131	Transport Economics	3	0	0	3
2	TE9132	Traffic Flow Theory	3	0	0	3
3	E3	Elective III	3	0	0	3
PRACTICAL						
4	TE9133	Practical Training (4 Weeks)	0	0	0	1
5	TE9134	Project Work Phase I	0	0	6	3
		TOTAL	**9**	**0**	**6**	**13**

SEMESTER VI

SL No	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1	TE9141	Project Work Phase II	0	0	30	15
		TOTAL	0	0	30	**15**

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE = 67

ELECTIVES

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	TE 9151	Sustainable Urban and Transport Development	3	0	0	3
2	TE 9152	Intelligent Transportation Systems	3	0	0	3
3	TE 9153	Environmental Laws and Impact Assessment of Transportation Projects	3	0	0	3
4	TE 9154	Highway Project Management	3	0	0	3
5	TE 9155	Pavement Management System	3	0	0	3
6	TE 9156	Highway Safety and Safety Audit	3	0	0	3
7	TE 9157	Advanced System Dynamics Modeling in Transportation Engineering	3	0	0	3
8	TE 9158	Urban Transportation Infrastructure – Planning and Design	3	0	0	3
9	TE 9159	Airport System Planning and Design	3	0	0	3
10	TE 9160	Rail Transportation Systems – Planning and Design	3	0	0	3
11	TE 9161	Waterways Transportation System – Planning and Design	3	0	0	3
12	TE 9162	Remote Sensing and GIS in Transportation Development	3	0	0	3

TE 9101 TRANSPORTATION SYSTEMS PLANNING L T P C
3 0 0 3

OBJECTIVE:

- To provide basic knowledge in the field of Transportation Planning and Travel demand forecasting

UNIT I TRANSPORTATION SYSTEMS 8

Systems Approach to Transport Planning – Interdependence of the Landuse and Traffic– Stages in Transportation Planning – Transport Planning Considerations Travel Forecasting Process – Statutory Land Use Planning Process – Planning Issues

UNIT II TRANSPORTATION INVENTORIES 9

Concepts of Zoning – Methods of Transportation Surveys – Inventory of Transport and other activities – Planning Studies and Methods – Development of Planning Process

UNIT III TRAVEL DEMAND FORECASTING 10

Conventional Modeling Process – Four Stage Modeling Processes – Trip Generation Models – Trip Distribution Models and Calibration – Advancement in Trip End Modeling

UNIT IV ROUTE AND MODE CHOICE MODELING 9

Methods of Trip Assignment Models – Multi Modal Trip Assignment – Mode Choice and Modal Split Models – Advancement in Route Choice and Mode Choice Modeling

UNIT V LAND USE TRANSPORT MODEL (LUT) 9

Accessibility Measures and Basic Theories – Lowery Derivatives Model- Garim Model – Basics of Systems Approach in LUT Model- Classification of Land use Models – Intercity Travel Demand Models – Transit Planning and Services

TOTAL: 45 PERIODS

REFERENCES:

1. Jotin Khisty C, Kent Lall B, Transportation Engineering – An Introduction, Third Edition, Prentice Hall of India, New Delhi, 2002
2. Papacostas C.S., Prevedouros, Transportation Engineering and Planning, Third Edition, Prentice Hall of India, New Delhi, 2002
3. John D.Edwards (Edr.), Transportation Planning Hand Book, Second Edition, Institute of Transportation Engineers, Prentice Hall Inc., Washington DC, USA, 1999
4. John W Dicky, Metropolitan Transportation Planning – A Decision Oriented Approach, McGraw Hill, New York, 1984
5. O'Flaherty C.A, Transport Planning and Traffic Engineering, Elesevier Publications, New Delhi,1997

TE 9102 TRAFFIC ENGINEERING AND MANAGEMENT L T P C
3 0 0 3

OBJECTIVE:

- Provides a basic understanding on Traffic Engineering – Planning, Design, Operation and Management

UNIT I TRAFFIC CHARACTERISTICS 9

Physical, Physiological, Psychological, Environmental Characteristics, Traffic Stream Characteristics, Vehicle Characteristics – Static and Dynamic, Urban Road and Road Characteristics.

UNIT II SURVEYS AND STUDIES IN TRAFFIC ENGINEERING 9

Conventional and Modern Methods of Traffic Survey and Studies – Volume and Capacity – Headway concepts and applications – Speed and Delay – Origin and Destination, Parking, Accident – Level of Services (LoS)

UNIT III GEOMETRIC DESIGN OF ROADS 9

Design of roads – Design Speed, Terrain, Gradient curves – Horizontal and Vertical, Superelevation, Sight Distance – Stopping Sight Distance, Overtaking Sight Distance, Design of Cycle Tracks, Pedestrian Facilities, Parking Facilities, Street Lighting

UNIT IV INTERSECTION DESIGN 9

Design of Intersection – At grade intersection – Uncontrolled, Channelisation, Rotary, Traffic Signal Control, Signal Co-ordination, Grade Separated Intersection Types and Design

UNIT V TRAFFIC OPERATION AND MANAGEMENT 9

Traffic Sign, Road Markings, Traffic Control Aids, Street furniture, Road Arboriculture - Traffic Regulation, Cost Effective Management Measures – Traffic Systems Management and Travel Demand Management - Congestion Management, Traffic Calming and Pricing

TOTAL: 45 PERIODS

REFERENCES:

1. Wolfgang S.Homburger et.al., 'Fundamentals of Traffic Engineering' 15th Edition, Institute of Transportation Studies, University of California, Berkely, 2001
2. James L.Pline (Edr) 'Traffic Engineering Hand Book', Institute of Transportation Engineers, Washington DC, USA, 1999
3. Nicholas T.Garber, Lester A Hoel, 'Traffic and Highway Engineering', Revised Second Edition, ITP, California, USA, 1999
4. Thomas Curinan, 'An Introduction to Traffic Engineering – A Manual for Data Collection and Analysis', Books Cole, UK, 2001
5. Kadiyali, L.R., 'Traffic Engineering and Transport Planning', Khanna Publishers, Delhi, 2002

TE 9103 PAVEMENT MATERIALS AND CONSTRUCTION L T P C
3 0 0 3

OBJECTIVE:

- To make the students to understand the properties and use of various materials and construction procedures for flexible and rigid pavements.

UNIT I SUBGRADE 9

Significance of subgrade soil – soil classification – evaluation of soil strength – CBR and plate load test – earth work grading – construction of embankments and cuttings – preparation of subgrade – quality control tests – subgrade stabilization

UNIT II MATERIALS FOR FLEXIBLE PAVEMENT 9

Bitumen – types and grades – properties and testing of materials used in granular layers and bituminous layers – Types of granular and bituminous mixes –– mix design for granular materials – bituminous mix design - super pave concepts – new materials like polymer modified bitumen, geosynthetics etc.

UNIT III MATERIALS FOR RIGID PAVEMENT 9

Cement – grades – chemical composition – hydration of cement – testing – admixtures – fibres - properties and testing of pavement quality concrete – mix design – acceptance criteria

UNIT IV CONSTRUCTION PROCEDURES 9

Methods of construction and field control checks for various types of flexible pavement layers – recycling of bituminous materials
Cement concrete pavements – methods of construction of various layers – joints-quality control tests

UNIT V HIGHWAY CONSTRUCTION EQUIPMENTS 9

Excavators, graders, vibratory rollers, sensor pavers, computerized asphalt mix plant, plants and trucks for ready mix concrete, slip form paver – working principle, advantages and limitations

TOTAL: 45 PERIODS

REFERENCES:

1. Specifications for Road and Bridge works, Fourth Revision, MoSRT&H(India), 2001
2. IRC 15 – 2002, Standard Specifications and Code of Practice for Construction of Concrete Roads
3. Peurify.R.L., Construction Planning, Equipment and Methods, McGraw Hill Publishers, New York, 2000
4. S.C.Sharma., Construction Equipment and its Management, Khanna Publishers, New Delhi, 1988
5. Asphalt Technology and Construction Practices, The Asphalt Institute, Maryland, USA, 1997

TE 9104 URBAN AND REGIONAL DEVELOPMENT L T P C
3 0 0 3

OBJECTIVE:

- Provides a basic knowledge on Urbanisation and its trend.
- Deals with different types of plan, its implementation, regional development and management for sustainable Urban growth.

UNIT I BASIC ISSUES 8

Urban planning and Development – Definition of terms, Explanation of concepts, National policies and strategies on issues related to Urban development – Trends of Urbanisation – International, National and Regional level – Positive and Negative impacts of Urban development

UNIT II PLANNING PROCESS 7

Principles of planning – Types and levels of Urban plans, Stages in the planning process – goals, objectives, delineation of planning areas, surveys and analysis.

UNIT III DEVELOPMENT PLANS, PLAN FORMULATION & EVALUATION 12

Scope and content of Regional Plan, Master Plan, Detailed Development Plan, Structure Plan, Sub Regional Plan, DCR planning and developments of industrial estates, SEZ, Development strategies, formulation and evaluation.

UNIT IV PLAN IMPLEMENTATION 9

Constraints for plan implementation – Industrial, Financial and Legal Constraints, Institutional Arrangements for Urban Development – Financing of Urban Developments - Legislation related to Urban Development.

UNIT V URBAN MANAGEMENT 9

Urban Management Information System, Development Control System, Decision Support System for Urban Management – Involvement of public, private, NGO, CBO & Beneficiaries.

TOTAL: 45 PERIODS

REFERENCES:

1. CMDA, Second Master Plan for Chennai, Chennai 2008
2. Goel, S.L Urban Development and Management, Deep and Deep publications, New Delhi 2002
3. George Chadwick, A Systems view of planning, Pergamon press, Oxford 1978
4. Singh V.B, Revitalised Urban Administration in India, Kalpaz publication, Delhi 2001
5. Edwin S.Mills and Charles M.Becker, Studies in Urban development, A World Bank publication, 1986

TE 9105 **PAVEMENT MATERIALS LAB** **L T P C**
0 0 4 2

OBJECTIVE:

- To make the students to learn about various testing procedures on pavement materials.

LIST OF EXERCISES

1. Tests on conventional bitumen, bitumen emulsion, cut back bitumen and modified bitumen.
2. Tests on road aggregates.
3. Tests on bituminous mixture.
4. Design of dense bituminous mixes.
5. Design of pavement quality concrete mix.

TOTAL: 60 PERIODS

LABORATORY EQUIPMENT REQUIREMENTS
(For a batch of 25 students)

1.	Penetration test apparatus	-	2 Nos.
2.	Ductility testing machine	-	2 Nos.
3.	Flash point apparatus	-	2 Nos.
4.	Frass breaking point apparatus	-	2 Nos.
5.	Rolling thin film oven	-	1 No.
6.	Bitumen viscometer	-	1 No.
7.	Aggregate impact testing machine	-	2 No.
8.	Los Angel's abrasion testing machine	-	1 No.
9.	Flakiness index gauge	-	2 Nos.
10.	Elongation index gauge	-	2 Nos.
11.	Compression testing machine with flexure test assembly	-	1 No.
12.	Marshall stability testing machine	-	1 No.
13.	Slump cone apparatus	-	1 No.
14.	Compaction factor apparatus	-	1 No.
	Total number of equipments	**-**	**21**

TE 9106 TRAFFIC SURVEYS AND ANALYSIS (PRACTICAL) L T P C
0 0 4 2

OBJECTIVE:

- Provides clear understanding on conducting various types of traffic surveys data collection, analysis, inference and presentation

LIST OF EXERCISES

Conduct of the following surveys related to Transport Development, Analysis, Inferences and Proposals.

i) Volume count
ii) Spot speed
iii) Speed and delay studies
iv) Parking studies
v) Origin and destination studies
vi) Physical inventory using total station survey equipment
vii) Environmental impact – Noise studies and vehicular emission measurement
viii) Lighting studies

TOTAL : 60 PERIODS

LABORATORY EQUIPMENT REQUIREMENTS
(For a batch of 25 students)

1.	Automatic traffic counter	-	2 Nos.
2.	Dopplar radar	-	2 Nos.
3.	Road measurement and data acquisition system	-	1 No.
4.	Noise level meter	-	2 Nos.
5.	Five gas analyzer	-	1 No.
6.	Lux meter	-	1 No.
7.	Total station	-	1 No.
	Total number of equipments	**-**	**10**

TE 9121 BUS AND RAIL TRANSIT SYSTEM PLANNING L T P C
3 0 0 3

OBJECTIVE:

- To identify the role of various modes of Mass Transportation like Bus and Rail and its Planning and Management

UNIT I TRANSIT SYSTEM AND ISSUES 6

Introduction to Mass Transport – Role of various modes of Mass Transport – Problems and their Impact – Transport System Performance at National, State, Local and International levels – Evaluation of existing system – Transit Oriented Land Use Development - Case Studies

UNIT II PUBLIC TRANSIT SYSTEM 9

Urban Transport System – Public Transport System Re-genesis and Technology – Public Transport Demand and Supply – Physical performance of Public Transport System – Public Transport and Urban Development Strategies

UNIT III BUS TRANSIT 10

Route Planning and Scheduling – Bus Transport System – Performance and Evaluation – Scheduling – Conceptual patterns of bus service – Network Planning and Analysis – Bus Transport System Pricing – Bus Transit System Integration – Analytical Tools and Techniques for Operation and Management – Bus Rapid Transit Systems – Case Studies

UNIT IV RAIL TRANSIT 10

Characteristics of Rail Transit – Planning and Design – Performance Evaluation – Efficiency, Capacity, Productivity ad Utilisation – Performance Evaluation Techniques and Application – System Network Performance – Transit Terminal Planning and Design – Metro Rail Transit Systems - Case Studies

UNIT V IMPACT OF TRANSIT 10

Policies and Strategies for Mass Transport – Need for Integrated Approach – Unified Transport Authorities – Institutional arrangement – Private Sector in Mass Transport – Bus and Rail Integration – Co-ordinator of Feeder Services – Urban Transportation and Land use – Impact of Transport Development on Environment – Remedial measures – Policy Decisions – Recent Trends in Mass Transportation Planning and Management

TOTAL: 45 PERIODS

REFERENCES:

1. Michael J.Bruton , An Introduction to Transportation Planning, Hutchinson,1985
2. Michael D.Meyer and Eric J.Miller , Urban Transportation Planning – A Decision Oriented Approach, McGraw Hill Book Company, New York,1984
3. F.D.Hobbs, Traffic Planning and Design, Poargamon Oress
4. John W.Dickey, Metropolitan Transportation Planning – Tata McGraw Hill Publishing Company Limited, New Delhi, 1980
5. Paul H.Wright, Transportation Engineering – Planning and Design, John Wiley and Sons, New York, 1989.

TE 9122 TRANSPORTATION MODELING AND SIMULATION L T P C
3 0 0 3

OBJECTIVE:

- Offers various techniques to be adopted in simulating and modeling transportation systems for planning and management

UNIT I SYSTEMS APPROACH 9

System – Concepts, Theories – Classification – Models – Phases in model building process – System Approach – System Dynamics(S.D) View Points – Physical Flow – Information Flow – Flow Diagram.

UNIT II MODEL CONCEPTUALISATION 9

Causal Loop (CL) Diagramming – Diagramming Approach – Justification for links – Conceptualisation and Development of Causal Loop Representations -Case Study examples in C.L diagramming in Transportation Planning

UNIT III SYSTEM DYNAMICS MODELING 10

Principles of Systems and its Hierarchies – System Dynamic Model – Application to Transportation Infrastructure Planning – Sensitivity ad Dimensional Analysis – Validation of System Dynamics Model

UNIT IV TRANSPORTATION MODELING 8

Conventional Modeling – Computer Simulation Modeling efforts – Application of relevant softwares in Transportation Planning – Transportation Simulation - Transportation Assignment - GIS Application in Transportation Planning

UNIT V MODEL VALIDATION 9

Concepts of Model Verification – Testing – Sensitivity and Dimensional Analysis – Significance of Sensitivity Testing – Methods of Validation – S.D Model Validation and Calibration – Conventional Model Validation – Simulation Model Validation efforts

TOTAL: 45 PERIODS

REFERENCES:

1. Pratab Mohapatra K.J.et al., Introduction to System Dynamics Modeling, University Press, Hyderabad,1994
2. Thirumurthy A.M., Environmental Facilities and Urban Development in India – A System Dynamics Model for Developing Countries, Academic Foundations, India,1992.
3. Nancy Roberts et al., Introduction to Computer Simulation – A System Dynamics Modeling Approach, Addison – Wesley, London,1983
4. Papacostas C.S., Prevedouros , Transportation Engineering and Planning, Third Edition, Prentice Hall of India, New Delhi,2002
5. John D.Edwards, Jr. P.E, Transportation Planning Handbook, Institute of Transportation Engineers, Prentice Hall Publication, Washington D.C., USA,1999

TE 9123 PAVEMENT ANALYSIS, DESIGN AND EVALUATION L T P C
3 0 0 3

OBJECTIVE:

- To expose the students to various procedures on pavement analysis, design and evaluation techniques.

UNIT I SUBGRADE ASSESSEMENT 9

Comparison of flexible and rigid pavements – functions and significance of subgrade properties, various methods of assessment of subgrade soil strength for pavement design - factors affecting design and performance of pavements

UNIT II ANALYSIS OF FLEXIBLE PAVEMENTS 9

Stresses and deflections in homogeneous masses – Burmister's two layer, three layer and multi-layer theories – wheel load stresses – ESWL of multiple wheels – repeated loads and EWL factors – sustained loads and pavement behaviour under traffic loads

UNIT III FLEXIBLE PAVEMENTS DESIGN METHODS 9

Principle, design steps, advantages and applications of different pavement design methods – Group Index, CBR, McLeod, Kansas triaxial test, IRC and Asphalt Institute methods

UNIT IV ANALYSIS AND DESIGN OF RIGID PAVEMENTS 9

Stresses and deflections in rigid pavements – Westergaard's analysis, Bradbury's coefficients, IRC design charts – wheel load stress, warping stress, frictional stress and combination of stresses – types of joints – Design of slab and joints – IRC method of design

UNIT V EVALUATION AND MAINTENANCE 9

Distresses in flexible and rigid pavements – structural and surface condition evaluation techniques – maintenance strategies - pavement performance prediction concepts and models – design of overlays

TOTAL: 45 PERIODS

REFERENCES:

1. Yoder,E.J and Witezak, Principles of Pavement Design, John Wiley and Sons, 1975
2. Yang H. Huang, Pavement Analysis and Design, Prentice Hall, New Jersy, 1993
3. IRC 37-2001, Guidelines for the Design of flexible Pavements, Indian Roads Congress
4. IRC 58-2002, Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, Indian Roads Congress

TE 9124 **QUANTITATIVE TECHNIQUES FOR TRANSPORTATION ENGINEERING** **L T P C**
3 0 0 3

OBJECTIVE:

- Offers various Statistical and Analytical Techniques and its application in traffic and transportation engineering

UNIT I SAMPLING AND SURVEY METHODS 9

Types of Random Sample – Central Limit Theorem – Sampling Distribution – Estimation of sample size – Sampling error – Design of Survey Questionnaire - Data collection – Data Processing and Analysis – Application in Transportation Engineering

UNIT II PROBABILITY DISTRIBUTIONS 10

Probability Distributions – Discrete and Continuous Distribution – Binomial - Poisson – Normal – Exponential Distributions – Application in Traffic Engineering – Grouping of data – Presentation

UNIT III SIGNIFICANCE TESTING 8

Hypotheses testing – Types of error – One tailed and two tailed test – Small sample and large sample test – Selection of significance level - Chi square test

UNIT IV LINEAR REGRESSION MODELS 9

Simple and Multiple Linear Regression – Coefficient of correlation – Stepwise regression – Tests on significance of the regression – T and F tests – Basics and Significance of Non-linear regression analysis

UNIT V NETWORK ANALYSIS 9

Network Flow Problems – Transportation and Assignment Problems – Maximal – Flow – Shortest Route – Dijkstra's Algorithm – Minimal Spanning Tree Problem – Application in Transportation Network Planning

TOTAL: 45 PERIODS

REFERENCES:

1. John W Dickey and Thomas M.Watts, Analytic Techniques in Urban and Regional Planning, McGraw Hill,1978
2. Ravindran, Phillips and Solberg, Operations Research, Principles and Practice, John Wiley and Sons, New York,2000
3. William G. Cochran, Sampling Techniques, John Wiley Series in Probability and Mathematical Statistics – Applied, New York,1999
4. Richard I.Levin and David S.Rubin, Statistics for Management, Prentice Hall Publication, New Delhi, 1997
5. Kadiyali, L.R., Traffic Engineering and Transport Planning, Khanna Publishers, Delhi, 2006

TE 9126 PAVEMENT EVALUATION LAB L T P C
0 0 4 2

OBJECTIVE:

- To make the students to understand various pavement evaluation techniques.

LIST OF EXERCISES

1. Visual pavement condition survey
2. Objective survey of distresses such as patches, potholes, ravelling, edge breaking and cracking.
3. Roughness measurements.
4. Skid resistance measurements.
5. Benkelman beam deflection test.
6. Traffic surveys, subgrade investigation and design of flexible and rigid pavements.

TOTAL: 60 PERIODS

LABORATORY EQUIPMENT REQUIREMENTS
(For a batch of 25 students)

1.	Road measurement and data acquisition system(ROMDAS)	-	1 No.
2.	Fifth wheel bump integrator	-	1 Nos.
3.	Skid resistance tester	-	1 No.
4.	Benkelman beam deflection apparatus	-	2 Nos.
5.	CBR testing machine	-	1 No.
6.	Wheel weighing pad	-	2 Nos.
7.	Automatic traffic counter	-	2 Nos.
	Total number of equipments	**-**	**10**

TE 9127 TRANSPORTATION PROJECTS – FIELD STUDIES L T P C
0 0 4 2

OBJECTIVE:

- Helps in formulation and evaluation of Transportation Engineering projects

LIST OF EXERCISES

Formulation and evaluation of the following Transportation Projects**.**

i) Transportation management
ii) Parking management
iii) Road accident studies
iv) Public transport route evaluation
v) Traffic signal – capacity evaluation
vi) Rotary design

TOTAL : 60 PERIODS

LABORATORY EQUIPMENT REQUIREMENTS
(For a batch of 25 students)

1.	Automatic traffic counter	-	2 Nos.
2.	Dopplar radar	-	2 Nos.
3.	Road measurement and data acquisition system	-	1 No.
4.	Noise level meter	-	2 Nos.
5.	Five gas analyzer	-	1 No.
6.	Lux meter	-	1 No.
7.	Total station	-	1 No.
8.	Softwares such as TRANSYT, CUBE, ARC GIS, Emme/2, TransCAD and Geomedia	-	6 Nos. (One in each software)
	Total number of equipments	**-**	**10**
	Total number of softwares	**-**	**6**

TE 9131	TRANSPORT ECONOMICS	L T P C
		3 0 0 3

OBJECTIVE:

- To provide knowledge in various methods of economic evaluation and financing practices of road transport projects

UNIT I ECONOMIC EVALUATION 9

Need for Economic Evaluation of Urban Transport Projects – Principles of EconomicAnalysis – Methods of Economic Evaluation – Comparison of various methods – Case Studies

UNIT II ROAD USER COSTS 8

Components of vehicle operating cot – Factors affecting vehicle operating cost – Value of Travel Time Saving, Accident Cost, Sensitivity Analysis – Case Studies

UNIT III TRANSPORT ECONOMICS 8

Transport and Economics – Movement, Transportation and Location – The demand for Transport – The supply of transport – Direct cost of transport, External cost of transport – Subsidy in Transport

UNIT IV TRANSPORT PRICING 10

Transport costs – Elasticity of demand – Average cost and Marginal cost pricing – Market Pricing and Market Segmentation – Second best pricing – Pricing Policy – Congestion Pricing – Public and Private Transport Pricing – Price Co-ordination

UNIT V FINANCING TRANSPORT SYSTEM 10

Characteristics of Transportation Infrastructure – Trends in Transportation Infrastructure – Investment Needs, Options and Budgetary Support in Transport Sector – Existing Financing Practices – Build, Operate and Transfer (BOT) – Principles and BOT variants - Costing Transport – Cost Recovery, Pricing – Alternative Financial Resources – Special Purpose Vehicles

TOTAL: 45 PERIODS

REFERENCES:

1. Robert F Baker, (eds), Hand Book of Highway Engineering, Van Nostrand Reinhold Company, New York, 1975
2. Kadiyali L.E; Traffic Engineering and Transport Planning, Khanna Publishers, 1999
3. Khanna S.K., Justo, C.E.G; Highway Engineering, New Chand and Bros, Roorkee, 1998
4. Hanspeter George; Cost Benefit Analysis and Public Investment in Transport – A Survey Butterworths, London, 1973
5. The Institution of Engineers India (1997), Proceedings of the National Seminar on Infrastructure Development – Strategies for Transportation Sector, New Delhi.

TE 9132 **TRAFFIC FLOW THEORY** **L T P C**
3 0 0 3

OBJECTIVE:

- To impart knowledge in Traffic Flow Characteristics, Flow Modeling and Computer Simulation

UNIT I TRAFFIC FLOW FUNDAMENTALS 10

Fundamentals of Traffic Flow – Flow Parameters – Nature of traffic flow – Approaches to Traffic Flow – Spacing, Gap and Headway Characteristics – Probabilistic aspects of Traffic Flow – Various Distributions – Gap acceptance – Vehicle arrival studies

UNIT II TRAFFIC DELAYS 10

Lighthill and Withams Theory – Application of theory to deal bottlenecks – Trajectory Diagrams – Shock waves – Propagation and equation – Gree burgs extension of law of continuity – Car Following theory

UNIT III TRAFFIC FLOW CHARACTERISTICS 8

Traffic Flow characterization – Categories of Traffic Flow – Macroscopic and Microscopic Traffic Flow Models – Centrally versus Individually controlled modes – Vehicular Stream Models

UNIT IV SIMULATION MODELS 9

Basics of simulation – Simulation Model and Classification – Simulation o Urban Traffic Flow Characteristics - Application of Computer Simulation in Traffic Flow Studies – Future Traffic Simulation Model

UNIT V QUEUING MODELS 8

Queuing Theory – Types of Queuing Model – Queuing Characteristics and Behaviour – Transition Diagram – Queuing Cost Model Application to Traffic Engineering

TOTAL: 45 PERIODS

REFERENCES:

1. Drew, D.R., Traffic Flow Theory and Control, McGraw Hill, NewYork,1968
2. Highway Capacity Manual, Special Report 209, Transportation Research Board (TRB), National Research Council, Washington DC,1988
3. May A.D., Traffic Flow Fundamentals, Prentice Hall Inc., New Jersey,1990
4. Papacostas C.S., Prevedouros, Transportation Engineering and Planning, Third Edition, Prentice Hall of India, New Delhi,2002
5. Kadiyali, L.R, Traffic Engineering and Transport Planning, Khanna Publishers, Delhi,2006.

TE 9151 SUSTAINABLE URBAN AND TRANSPORT DEVELOPMENT L T P C
3 0 0 3

OBJECTIVE:

- Helps in understanding the basic concept of Sustainable Urban and Transport Development and its influence on region, city and built environment.

UNIT I SUSTAINABLE URBAN AND TRANSPORT PRINCIPLES 8

Urban Environmental Sustainability, Urban Development, Urban Sustainable Development, Methods and Tools for Sustainable Appraisal, Sustainable Transportation – Principles, indicators and its implications

UNIT II URBAN PLANNING AND ENVIRONMENT 7

Environment and Resources, Sustainability Assessment, Future Scenarios, Shape of Urban Region, Managing the change, Integrated Planning, Sustainable Development

UNIT III URBAN REGION AND ENVIRONMENT 7

City Centre, Development Areas, Inner City Areas, Suburban Areas, Periurban and Country side, Economy and Society

UNIT IV THE URBAN BUILT-IN ENVIRONMENT 9

Urban Form, Land Use, Compact Development, Transport Integrated Urban Planning, Housing, and Household, Services and Industry, Guidelines for Environmentally sound Transportation

UNIT V TRAVEL AND TRANSPORT 14

Transport and Environment – Equity Principle, Accessibility, Mobility – Roads, Traffic, Public Transport, Business and Goods Traffic, Air Quality, Energy-supply and Demand, Climate Change, Public and Private Partnership, Financing and Pricing – Economic Benefits of Sustainable Transportation

TOTAL: 45 PERIODS

REFERENCES:

1. Joe Ravetz, City Region 2020 – Integrated Planning for a Sustainable Environment, 2000
2. George Godwin; Traffic, Transportation and Urban Planning; Pitmen Press, Great Britain , 1981
3. Sustainable Transportation and TDM – Planning the balances, Economic, Social and Ecological objectives; Victoria Transport Policy Institute, 2007
4. UNCHS, Habitat, Cities in a Globalizing world, Global report on Human Settlement, 2001

TE 9152 INTELLIGENT TRANSPORT SYSTEMS L T P C
3 0 0 3

OBJECTIVE:

- To expose the recent advancements in Transport Systems

UNIT I MANAGEMENT INFORMATION SYSTEMS 8

Characteristics of Information, Constituents of Computer Based Information Systems, Element and functions of Management Information Systems in Urban Transportation Sectors – Development of Database and Management Information System – Concept of Database – Development of Transportation Database

UNIT II TRANSPORTATION MANAGEMENT 9

Objective of Transportation Management – Core functions of Transport Management – Traffic Signal System – Freeway Management Systems (FMS) Information Technologies – Information Systems Concept – Overview of the System Development Cycle – Traditional System Development Life Cycle Methodology – Decision Support System (DSS) in Urban Transport Development

UNIT III INTELLIENT TRANSPORT TECHNOLOGIES 10

Wireless Communication – Computational Technologies – Floating Car Data / Floating Cellular Data – Sensing Technologies – Inductive Loop Detection – Video Vehicle Detection – Advanced Traffic Sensors and Surveillance Systems – Dynamic Message Sign (DMS) Positioning Systems – Maps – Maps Matching – Path Finding and Route Guidance, Information Dissemination and Display Technologies

UNIT IV INTELLIGENT TRANSPORT APPLICATION 10

Technologies for delivering Pre-Trip and En-route Traveler Information – Electronic Payment Technologies – Electronic Toll Collection – Emergency Vehicle Notification Systems – Fleet Operation and Management – Cordon Zones with Congestion Pricing, Automatic Road Enforcement

UNIT V INTELLIGENT TRAFFIC MANAGEMENT 8

Intelligent Speed Adaptation – Telematics – Traffic Estimation and Prediction Systems, Multimodal Travel Management and Traveler Information – SCATS Traffic Signal Systems, the Challenge of ITS and ORM versus traditional Transportation Improvements, Technical Function in Integrating ITS and Transport Planning

TOTAL: 45 PERIODS

REFERENCES:

1. Intelligent Transport Systems, Intelligent Transportation Primer, Washington, US, 2001
2. Henry F.Korth, and Abraham Siberschatz, Data Base System Concepts, McGraw Hill, 1992
3. E.Turban, Decision Support and Export Systems Management Support Systems, Maxwell Macmillan, 1998
4. Sitausu S.Mittra, Decision Support Systems – Tools and Techniques, John Wiley, New York, 1986
5. Cycle W.Halsapple and Andrew B.Winston, Decision Support Systems – Theory and Application', Springer Verlog, New York, 1987

TE 9153 ENVIRONMENTAL LAWS AND IMPACT ASSESSMENT OF TRANSPORTATION PROJECTS **L T P C**
3 0 0 3

OBJECTIVES:

- Provides an exposure to various Environmental Laws and importance of EIA on Transportation Projects with respect to noise, air pollution, visual intrusion etc.

UNIT I ENVIRONMENTAL MAINTENANCE AND LEGAL SYSTEMS 10
Laws concerned with protection of the environment such as Environmental Protection Act, Air and Noise Pollution Act, Motor Vehicle Act, Town and Country Planning Act, Development Control Regulation, Coastal Regulation Zone

UNIT II ENVIRONMENTAL STANDARDS IN URBAN AREAS AND EIA 10
Importance of EIA, Environmental Appraisal, EIA Statement, Vehicle and Traffic Noise, Ambient Noise Level, Heath Effects, Vibration – Damage to building, Exhaust Emission – Pollutant, Health effects, Air Pollution, Urban Ambient Air Quality Standards, Effects on Human being, Vegetation and Animals

UNIT III MEASUREMENT AND POLLUTION PREDICTION 10
Measurement of Air and Noise Pollution, Land Acquisition, Rehabilitation, Collection, Compilation and Presentation of Pollution and Impact Data, Measuring Impact before construction, at the time of construction and after construction, Prediction, Modeling and Validation

UNIT IV MITIGATIVE MEASURES AND POLICIES 8
Mitigative Measures for Air and Noise Pollution Policies and Strategies, Involvement of Stakeholders, Public Participation, Institutional Arrangements

UNIT V ENVIRONMENTAL QUALITY AND MANAGEMENT 7
Impact of Traffic on Environment – Network Pattern, Urban Growth Indicators of Environmental Quality, Energy use, Fuel Economy in Transportation, Energy Efficiency strategies

TOTAL: 45 PERIODS

REFERENCES:

1. Larry W Canter, Environmental Impact Assessment, McGraw Hill Publishers, 1996.
2. Rao V.Kolluru; Environmental Strategies Handbook, McGraw Hill Publishers, 1994.
3. David Banister; Transport Policy and Environment E&FN Spain, 1999
4. World Bank; the Impact of Environmental Assessment – A Review of World Bank Experience, Washington, 1997.
5. World Bank; Road and the Environment, Washington, 1997.

TE 9154 HIGHWAY PROJECT MANAGEMENT L T P C
3 0 0 3

OBJECTIVE:

- To make the students to understand the highway project management covering planning, project preparation and evaluation**.**

UNIT I INSTITUTIONAL ARRANGEMENTS 9

Project formulation – detailed project report – agencies involved in projects – design consultants – supervision consultants – contractors for implementation – Govt agencies – linkages among organizations – environment and social issues - responsibilities of various agencies – discussion on various models

UNIT II PROJECT FINANCING 9

Types of financing – financial institutions – internal generation of funds – international commercial borrowings – collaborator's equity participation – share subscription by overseas investors – other sources

UNIT - III ECONOMIC EVALUATION OF PROJECTS 9

Motor vehicle operation cost – value of time of travel – accident cost – other cost – annual highway cost – economic analysis – Indian and International practices of investment appraisal – risk analysis and selection of a project

UNIT IV PROJECT PLANNING AND CONTROL 9

Time and resources planning – project control methodology – resources productivity control – project cost control – project time control – codification of the planning system – network techniques

UNIT V CONTRACT MANAGEMENT 9

Types of contract – contract laws – contract formation and interpretation principles – contract conditions – FIDIC conditions – IBRD guidelines for procurement – TNTT Act – contract documents – potential contractual problems – arbitration and conciliation Act

TOTAL : 45 PERIODS

REFERENCES:

1. L.R.Kadiyali and N.B.Lal, Principles and Practices of Highway Engineering, Khanna Publishers, Delhi – 2005.
2. K.K.Chitkara ,Construction Project Management ,, Tata McGraw Hill Publishing Company Ltd, New Delhi – 2003.
3. P.K.Joy,Total Project Management, Macmillan India Limited, Delhi, 1999.

TE 9155 PAVEMENT MANAGEMENT SYSTEM L T P C
3 0 0 3

OBJECTIVE:

- To introduce the concepts of design, evaluation and performance of existing and new flexible and rigid pavements with due emphasis on systems approach and performance prediction models.

UNIT I PAVEMENT MANAGEMENT PROCESS 9

Historical background – general nature and applicability of systems methodology – basic components of Pavement Management System – planning pavement investments.

UNIT II EVALUATION AND PERFORMANCE 9

General concepts – economic and functional evaluation – evaluation of pavement performance – evaluation of structural capacity – pavement distresses – condition surveys – safety evaluation

UNIT III DESIGN STRATEGIES 9

Framework for pavement design – design objectives and constraints – basic structural response models – characterization of physical design inputs – generating alternative pavement design – economic evaluation of alternative design – analysis of alternative design strategies – selection of optimal design strategy.

UNIT IV PERFORMANCE PREDICTION MODELS 9

Techniques for developing prediction models – AASHO, CRRI and HDM models – computer applications.

UNIT V REHABILITATION 9

Repair of pavement defects – maintenance of flexible and rigid pavements – bituminous and cement concrete overlays – system analysis

TOTAL: 45 PERIODS

REFERENCES:

1. Ralph Haas, W.Ronald Hudson and John Zaniewski, Modern Pavement Management, Kreigar Publishing Company, New York, 1994
2. M.Y.Stalin, Chapman and Hall Pavement Management for Airports, Roads and Parking Lots , New York, 1992.
3. Michael Sargious, Pavements and surfacings for Highways and Airports, Applied Science Publishers Limited, London, 1975

TE 9156 HIGHWAY SAFETY AND SAFETY AUDIT L T P C
3 0 0 3

OBJECTIVE:

- Helps in identifying the reasons for road accidents and scientific I Investigation.
- Provides knowledge on safety audit and its methodology

UNIT I DESCRIPTION OF PROBLEMS 9

Causes of accidents – Human factors – Vehicles – Road and its condition – Environmental Studies

UNIT II ACCIDENT ANALYSIS TECHNIQUES 9

Collision Diagram – Preparation, Spatial Analysis of Accidents – Methods and GIS in Accident Analysis - Black Spot, Black Route and Area Identification

UNIT III BEFORE AND AFTER STUDIES 9

Accident Prediction Models – Development – Empirical Bayees Approach – Before and After Evaluation – Case Studies

UNIT IV SAFETY AUDIT 9

Need for Safety Audit – Concept and Elements of Safety Audit – Safety Audit for existing roads – Legal requirements – Provisions of Motor Vehicle Act and role of NGO's in prevention of accidents.

UNIT V ACCIDENT STUDIES AND INVESTIGATION 9

Accident data – Identification of Accident Prone Location – Prioritisation – Investigation – Problems and Remedies

TOTAL : 45 PERIODS

REFERENCES:

1. Khanna S.K. and Justo C.E.G, Highway Engineering, Nem Chand and Brothers, Roorkee, 2001
2. Robert F. Baker, Hand Book of Highway Engineering, Van Nonstrant Keinhold Company, New York, 1975
3. Ministry of Surface Transport, Accident Investigation and Prevention Manual for Highway Engineers in India, Government of India, 2001
4. Robert F.Baker, The Highway Risk Problem – Policy Issues in Highway Safety, John Wiley and Sons.

TE 9157 ADVANCED SYSTEM DYNAMICS MODELING IN TRANSPORTATION ENGINEERING L T P C 3 0 0 3

OBJECTIVE:

- To provide advanced level of knowledge in System Dynamics Modeling in Transportation Engineering

UNIT I COMPLEXITY AND SYSTEMS THINKING 8

Change – Complexity and Interdependency – Systems thinking – Floundering – Level of abstractions – Tools and Transitions in Systems Thinking – Synthesis and Organisational Learning

UNIT II ADVANCED MODELING EFFORTS 8

Steady State Modeling – Discrete vs. Continuous – Generic infrastructures –Subsystems – Sensitivity parametering - Case Studies

UNIT III ADVANCED SIMULATING TECHNIQUES 10

Graphical Bulletin function – Conveyor flows – Converter – Flow substitutes – Connector – Normalising Inputs – Generic flow activities – Case Studies

UNIT IV MODELING PROCESS 10

System Dynamics Modeling challenges – Steps in Modeling Process – Guidelines – Model Boundary – Modeling soft variables – Quantification vs. Measurement

UNIT V SOPHISTICATED DYNAMICS MODELING 9

Need – Isolation Process – Demand Expansions – Cycle functions – Sensitivity Analysis – Alternative view of Dynamic Modeling

TOTAL: 45 PERIODS

REFERENCES:

1. Pratab Mohapatra K.J. et al., Introduction to System Dynamics Modeling, University Press, Hyderabad, 1994
2. Thirumurthy A.M., Environmental Facilities and Urban Development in India – A System Dynamics Model for Developing Countries, Academic Foundations, India, 1992
3. Umadevi, G, Land Use Transport Interaction Modeling – A Systems Approach, Ph.D thesis, Division of Transportation Engineering, College of Engineering, Guindy, Anna University, Chennai, 2001
4. Technical Manual on An Introduction to Systems Thinking – STELLA Research Software, High Performance Systems Inc., Hannover, 1996
5. Advanced Manual on An Introduction to Systems Thinking – STELLAII Research Software, High Performance Systems Inc., Hannover, 2002

TE 9158 URBAN TRANSPORTATION INFRASTRUCTURE – PLANNING AND DESIGN

L	T	P	C
3	0	0	3

OBJECTIVE:

- Helps in Design of Intersections, Interchanges, Parking and Terminal Facilities to be provided in an urban area

UNIT I PRINCIPLES OF INTERSECTION DESIGN 8

Basic consideratios – simplicity – uniformity – Maneouvre Elements – Separation of conflict points – Design Elements – Design Speed – Intersection Curves – Super elevation for curves at Intersection – Intersection Sight Distance

UNIT II DESIGN OF AT-GRADE INTERSECTIONS 10

Capacity and LOS, Design of Rotary and Signalised Intersections, Vehicle Actuated Signals, Signal Co-ordination, Area Traffic Control System (ATCS), Pedestrian Planning at Grade Intersections

UNIT III DESIGN OF GRADE SEPARATED INTERSECTIONS 10

Design of Grade Separators – Principles , Design Criteria – Layout Design, GAD Preparation – Pedestrian Foot Over-bridge and Subway Design – Pedestrian Planning for Grade Separated Intersections

UNIT IV PARKING FACILITIES 8

Parking – Demand – Characteristics – Space Inventory – Accumulation – Duration – Turn over – Index – Design of Multi Storeyed and Surface Parking facility

UNIT V DESIGN OF TERMINAL FACILITIES 9

Bus Terminus – Design Principles – Design Elements – Design and Case Studies of Inter Modal Transfer Facilities – Design – Case Studies of Bus and Rail Terminals

TOTAL: 45 PERIODS

REFERENCES:

1. Robert F Baker, (Eds) Hand Book of Highway Engineering, Van Nostrand Reinhold Company, New York, 1975
2. New Jersy, Transportation and Traffic Engineering Hand Book, Institute of Transportation Engineers, Prentice Hall, INC, 1982
3. Kanna, S.K. and Justo, C.E.G. Highway Engineering, Nemchand and Brothers, Roorkee, 1998

TE 9159 AIRPORT SYSTEM PLANNING AND DESIGN L T P C
3 0 0 3

OBJECTIVE:

- Provides a basic understanding on Airport Systems Planning and Operation

UNIT I AIRPORT PLANNING 10

Airport – Accessibility – Transport Connections – Road and Rail, Expansion – Feasibility Studies – Environmental and Social Issues – Forecasting Future Traffic – Airfield Capacity and Delay - Aircraft characteristics – Airport Site Selection

UNIT II AIRPORT COMPONENTS 10

Airport Classification, Planning of Airfield Components – Runway, Taxiway, Apron, Hanger, Passenger Terminals

UNIT III AIR ROUTE PLANNING AND EVALUATION 9

Demand driven dispatch – Airline Fleet Planning Models – Network Revenue Management – Airport Performance, Slot Issues, Hub Operation, Demand Management, Multi-airport Systems

UNIT IV PASSENGER CHOICE, SCHEDULING AND FLEET ASSIGNMENT 7

Load Factor Analysis, Airline Schedule Development, Introduction to PODS Passenger Choice Models, Decision Window Model, Fleet Assignment

UNIT V AIRLINE ECONOMICS 9

Pricing – Privitization and Deregulation, Willingness to pay and Competitive Revenue Management

TOTAL: 45 PERIODS

REFERENCES:

1. Robert Honjeff and Francis X.Mckelvey, Planning and Design of Airports, McGraw Hill, New York, 1996
2. Richard De Neufille and Amedeo Odoni, Airport Systems Planning and Design, McGraw Hill, New York, 2003
3. Airport Planning and Systems – http://airportssystems.com/Course/index-html
4. S.K.Khanna and M.G.Arora, Airport Planning and Design, Nem Chand and Bros, 1999.

TE 9160 RAIL TRANSPORTATION SYSTEMS – PLANNING AND DESIGN L T P C

3 0 0 3

OBJECTIVE:

- To expose the various aspects of planning and design of Rail Transportation Systems.

UNIT I INTRODUCTION 9

Railway Industry – Privatization – Financing – Competition with Road Transport

UNIT II DEPENDABILITY ASPECTS 9

Regularity, Reliability, Punctuality and Safety – Modern tools to improve dependability – Time Table – Development – Scheduling - Restoring

UNIT III MANAGEMENT OF RAILWAY OPERATIONS 9

Demand based Railway Planning – Freight and Passenger Train Services – Asset Maintenance and Management

UNIT IV URBAN RAIL TRANSIT PLANNING 9

Urban Rail Transit Planning – MRTS – LRTS, Metro Rail – Monorail – Network Design, Capacity and Traffic Forecasting - Case Studies

UNIT V RAILWAY INFRASTRUCTURE 9

Modern Transit Facilities - Railway Track – Transfer Station – Structures – Bridges – Tunnels – Planning and Design aspects

TOTAL: 45 PERIODS

REFERENCES:

1. Brain Richards, Transport in Cities
2. Roberty Cervero, The Transit Metropolis, Island Press, 1998
3. Vukan R.Vuchie, Urban Transit: Operations, Planning and Economics, John Wiley and Sons Inc., 2005
4. Vukan R.Vuchie, Urban Transit Systems and Technology, John Wiley and Sons, 2007.

TE 9161 WATERWAYS TRANSPORTATION SYSTEMS – PLANNING AND DESIGN

L T P C
3 0 0 3

OBJECTIVE:

- To expose the various aspects of planning and design of Water Transportation Systems.

UNIT I INTRODUCTION **9**

Fresh Water and Salt Water Navigation – Ocean, Currents and Tide – Canals and Waterways – Ports – Types of Ships

UNIT II LOGISTICS AND MULTIMODAL TRANSPORT **9**

Containers – Distribution and Collection by Road and Rail – Vehicles and Equipment used – Trade Routes

UNIT III PORT AND TERMINAL MANAGEMENT **9**

Role of ports in trade and transport – Port facility for handling liner, dry bulk and liquid trade – Basics of Port Business – Customs – Immigration, Port Health – Marine Safety - Pricing

UNIT IV PORT PLANNING **9**

Traffic Forecast, Demand, Users, Capacity – Berth occupancy – Service time – Waiting time – Principles of Planning Port Layout – Handling characteristics – Voyage Estimating

UNIT V INLAND WATER AND OTHER MODES OF TRANSPORT **9**

Inland Water Transport – Planning, limitations and advantages – Case Studies – Pipelines – Ropeways – Beltways – other means of transport – Characteristics and Applications

TOTAL: 45 PERIODS

REFERENCES:

1. Leslie A.Bryan, “Principles of Water Transportation”, University of Chicago Press
2. Paul H.Wright, J.Ashford Norman, “Transportation Engineering, Planning and Design”, John Wiley and Sons Inc., 1997
3. “Shipping and Inland Water Transport for Eleventh Five Year Plan” – Report by Planning Commission

TE 9162 REMOTE SENSING AND GIS IN TRANSPORT DEVELOPMENT L T P C
3 0 0 3

OBJECTIVE:

- Introduce the students, the recent techniques of Remote Sensing and GIS and I Its application in Traffic and Transportation Engineering

UNIT I INTRODUCTION TO REMOTE SENSING 10

Definition – Components of Remote Sensing – Energy, Sensor, Interacting Body – Active and Passive Remote Sensing – Platforms – Aerial and Space Platforms – Balloons, Helicopters, Aircraft and Satellites – Electromagnetic Radiation – EMR Spectrum

UNIT II INTRODUCTION TO GIS 10

Basic Concept and Components – Hardware, Software – Data Spatial and non-spatial – Geo-referencing – Map Projection – Types of Projection – Simple Analysis – Data retrieval and querying

UNIT III DATA STRUCTURES AND ANALYSIS 9

Database – Raster and Vector data structures – Data storage – Run length, Chain and Block coding – Vector data storage – Topology – GIS Modelling - Raster and Vector data analysis – Buffering and overlaying techniques – Network Analysis – Spatial Analysis

UNIT IV BASIC APPLICATIONS IN TRANSPORTATION 8

Highway and Railway Alignment, location of transport terminals and roadside facilities, bus stops – Route optimization – Bus route rationalization – Accident analysis – Applications of Aerial Photography and Satellite Imageries

UNIT V ADVANCED APPLICATIONS 8

GIS as an integration technology – Integration of GIS,GPS and Remote Sensing Techniques – Advanced Traveler Information System (ATIS) – Automatic Vehicle Location System (AVLS)

TOTAL: 45 PERIODS

REFERENCES:

1. Anji Reddy, Remote Sensing and Image Interpretation, John Wiley and Sons Inc. New York, 1987.
2. M.G.Srinivas, Remote Sensing Applications, Narosa Publishing House, 2001.
3. Burrough P.A, Principles of GIS for Land Resources Assessment, Oxford Publication, 1994.
4. Jeffrey Star and John Ester, Geographical Information System – An Introduction, Prentice Hall Inc., Englewood Cliffe, 1990.
5. Marble, D.F, Calkins, H.W and Penquest, Basic Readings in GIS, Speed System Ltd., New York, 1984.