M.E TRANSPORTATION ENGINEERING

OBJECTIVES

- To introduce the students with the principles and practice of transportation engineering which focuses on Traffic and Transportation Engineering and Highway Engineering.
- To enable the students to have a strong analytical and practical knowledge of Planning, Designing and solving the transportation problems.
- To introduce the recent advancments in the field of Sustainable Urban Development,Traffic Engineering and Management, Systems Dynamics Approach to Transport Planning, Highway Design and Construction, Economic and Environment Evaluation of Transport Projects.
- To strength the students knowledge and technical know how to be efficient Transport Engineers.

OUT COME

- The students after completion of this course will have an indepth knowledge in Traffic Enginering , Transport Planning, Highway Design and Construction, Sustainable Urban and Transport Development and will be efficient enough to take up projects in the field.

- As the students have an hands on experience in working with the Software , live projects, field visits to various organizations and training sessions during the course of study, they will be full fledged Transport and Highway Planner.

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M.E. TRANSPORTATION ENGINEERING

CURRICULUM AND SYLLABUS FOR I TO IV SEMESTERS (FULL TIME)

SEMESTER I

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	TE8101	Pavement Design, Construction and Evaluation	3	0	0	3
2	TE8102	Quantitative Techniques for Transportation Engineering	3	1	0	4
3	TE8103	Traffic Engineering design and Management	3	0	0	3
4	TE8104	Transportation Systems Planning	3	0	0	3
5		Elective I	3	0	0	3
PRACTICAL						
6	TE8111	Pavement Materials and Evaluation Laboratory	0	0	4	2
7	TE8112	Traffic Surveys and Analysis	0	0	4	2
		TOTAL	**15**	**1**	**8**	**20**

SEMESTER II

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	TE8201	Mass Transit System Planning	3	0	0	3
2	TE8202	Road Safety System	3	0	0	3
3	TE8203	Sustainable Urban and Transport Development	3	0	0	3
4	TE8204	Transportation Modeling and Simulation	3	0	0	3
5	TE8205	Urban and Regional Planning	3	0	0	3
6		Elective II	3	0	0	3
PRACTICAL						
7	TE8211	CAD for Transportation Engineering	0	0	4	2
8	TE8212	Seminar	0	0	2	1
		TOTAL	**18**	**0**	**6**	**21**

SEMESTER III

SL No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	TE8301	Traffic Flow Theory	3	0	0	3
2	TE8302	Transport Economics	3	0	0	3
3		Elective III	3	0	0	3
PRACTICAL						
4	TE8311	Practical Training	-	-	-	1
5	TE8312	Project Work Phase I	0	0	12	6
		TOTAL	**9**	**0**	**12**	**16**

SEMESTER IV

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1	TE8411	Project Work Phase II	0	0	24	12
		TOTAL	**0**	**0**	**24**	**12**

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE = 69

ELECTIVES FOR M.E. TRANSPORTATION ENGINEERING

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	TE8001	Advanced System Dynamics Modeling in Transportation Engineering	3	0	0	3
2.	TE8002	Airport System Planning and Design	3	0	0	3
3.	TE8003	Environmental Impact Assessment of Transportation Projects	3	0	0	3
4.	TE8004	Intelligent Transportation Systems	3	0	0	3
5.	TE8005	Logistics in Transportation Engineering	3	0	0	3
6.	TE8006	Pavement Management System	3	0	0	3
7.	TE8007	Rail Transportation Systems – Planning and Design	3	0	0	3
8.	TE8008	Remote Sensing and GIS in Transportation Development	3	0	0	3
9.	TE8009	Urban Transportation Infrastructure – Planning and Design	3	0	0	3
10.	TE8010	Waterways Transportation System – Planning and Design	3	0	0	3

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M.E. TRANSPORTATION ENGINEERING

CURRICULUM AND SYLLABUS FOR I TO VI SEMESTERS (PART TIME)

SEMESTER I

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	TE8104	Transportation Systems Planning	3	0	0	3
2	TE8103	Traffic Engineering design and Management	3	0	0	3
3	TE8102	Quantitative Techniques for Transportation Engineering	3	1	0	4
PRACTICAL						
4	TE8112	Traffic Surveys and Analysis	0	0	4	2
		TOTAL	**9**	**1**	**4**	**12**

SEMESTER II

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	TE8201	Mass Transit System Planning	3	0	0	3
2	TE8204	Transportation Modeling and Simulation	3	0	0	3
3	TE8205	Urban and Regional Planning	3	0	0	3
		TOTAL	**9**	**0**	**0**	**9**

SEMESTER III

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	TE8101	Pavement Design, Construction and Evaluation	3	0	0	3
2		Elective I	3	0	0	3
PRACTICAL						
3	TE8111	Pavement Materials and Evaluation Laboratory	0	0	4	2
		TOTAL	**6**	**0**	**4**	**8**

SEMESTER IV

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	TE8203	Sustainable Urban and Transport Development	3	0	0	3
2	TE 8202	Road Safety System	3	0	0	3
3	TE8212	Seminar	0	0	2	1
4		Elective II	3	0	0	3
PRACTICAL						
5	TE8211	CAD for Transportation Engineering	0	0	4	2
		TOTAL	**9**	**0**	**6**	**12**

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SEMESTER V

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	TE8302	Transport Economics	3	0	0	3
2	TE8301	Traffic Flow Theory	3	0	0	3
3		Elective III	3	0	0	3
PRACTICAL						
4	TE8311	Practical Training	-	-	-	1
5	TE8312	Project Work Phase I	0	0	12	6
		TOTAL	**9**	**0**	**12**	**16**

SEMESTER VI

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1	TE8411	Project Work Phase II	0	0	24	12
		TOTAL	**0**	**0**	**24**	**12**

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE = 69

ELECTIVES FOR M.E. TRANSPORTATION ENGINEERING

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	TE8001	Advanced System Dynamics Modeling in Transportation Engineering	3	0	0	3
2.	TE8002	Airport System Planning and Design	3	0	0	3
3.	TE8003	Environmental Impact Assessment of Transportation Projects	3	0	0	3
4.	TE8004	Intelligent Transportation Systems	3	0	0	3
5.	TE8005	Logistics in Transportation Engineering	3	0	0	3
6.	TE8006	Pavement Management System	3	0	0	3
7.	TE8007	Rail Transportation Systems – Planning and Design	3	0	0	3
8.	TE8008	Remote Sensing and GIS in Transportation Development	3	0	0	3
9.	TE8009	Urban Transportation Infrastructure – Planning and Design	3	0	0	3
10.	TE8010	Waterways Transportation System – Planning and Design	3	0	0	3

Attested

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TE8101 PAVEMENT DESIGN, CONSTRUCTION AND EVALUATION L T P C
3 0 0 3

OBJECTIVE:

- The students is expected to understand the properties and use of various materials and construction, analysis of stress distribution, evaluation and maintenance of flexible and rigid pavements.

UNIT I PAVEMENT MATERIALS 9

Aggregates- requirements, properties and testing used in granular layers and bituminous layers, concept of size and gradation-design gradation, aggregate blending to meet specification. Cement-grades, chemical composition, testing, admixtures, fibers, properties and testing of pavement quality concrete, high performance concrete. Bitumen and Tar- origin, preparation, properties and chemical constitution of bituminous road binders. Bituminous emulsions and cutback - preparation, characteristics uses and tests, mechanism of stripping, adhesion failure.Bituminous mixes: preparation, design and testing.

UNIT II PAVEMENT CONSTRUCTION 9

Subgrade - Significance and functions, evaluation of soil strength, CBR and plate load test, earth work grading, preparation of subgrade, quality control test, subgrade stabilization. Flexible pavements - specification of materials, construction method and field control checks for various types of flexible pavements, super pave concept, new materials like polymer modified bitumen, geo synthetics. Rigid pavements - specification and method of construction, quality control tests, construction of various types of joints

UNIT III DESIGN OF FLEXIBLE PAVEMENTS 9

Factors affecting design and performance - Stresses and deflection in homogenous masses, Burmister's 2 layer, 3 layer and multi-layer theories , wheel load stresses, ESWL, pavement behavior under transient traffic loads, problems on above. CBR method, principle, advantages and application, testing as per IRC, AASHTO, and asphalt institute, problems on above.

UNIT IV DESIGN OF RIGID PAVEMENTS 9

Factors affecting design and performance, types of stresses ,causes and factors affecting stresses, EWL, Westergaard's analysis, Bradbury's coefficient, wheel load stresses, warping- frictional-combined stresses, problems on above.IRC design chart, design of longitudinal, contraction and expansion joints, and design of slabs.

UNIT V PAVEMENT EVALUATION AND MAINTENANCE 9

Failures in pavements- methods of measurement of skid resistance, unevenness, ruts and cracks. Pavement surface condition evaluation by physical measurements methods and their application, Calculation of IRI values - maintenance strategies evaluation by non-destructive tests- Benkelman beam method, overlay design. Pavement performance prediction concepts and models, recycling of pavements, pavement serviceability concepts, maintenance measures- short term and long term.

TOTAL : 45 PERIODS

OUTCOME:

- The students would have gained knowledge on the Material properties, Design, Evaluation and Management of Pavement Systems.

REFERENCES:

1. Alkins and Harold, "Highway Material" , Prentice Hall, Pearson, 2003
2. Kerbs and Walkes, "Highway Materials", McGraw Hill Book Co.2007
3. Specifications for" Road and Bridge works", Fourth Revision, MoSRT&H(India), 2001

4. IRC 15 – 2002, "Standard Specifications and Code of Practice for Construction of Concrete Roads".
5. Peurify.R.L., "Construction Planning, Equipment and Methods", McGraw Hill Publishers, New York, 2000.
6. S.C.Sharma., "Construction Equipment and its Management", Khanna Publishers, New Delhi, 1988.
7. Yang H. Huang, "Pavement Analysis and Design", Prentice Hall, New Jersy,1993
9 IRC 37-2001, "Guidelines for the Design of flexible Pavements", Indian Roads Congress
10 IRC 58-2002, "Guidelines for the Design of Plain Jointed Rigid" Pavements for Highways, Indian Roads Congress
11 Ralph Haos, "Ronald Hudson and Zaniesuki, Modern Pavement Management", Kneigr Publications, 1994

TE8102 QUANTITATIVE TECHNIQUES FOR TRANSPORTATION ENGINEERING

L	T	P	C
3	1	0	4

OBJECTIVE:

- Provides Knowledge on Statistical and Analytical Techniques and its application in traffic and transportation engineering

UNIT I SAMPLING AND SURVEY METHODS 11

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 15

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

UNIT III SIGNIFICANCE TESTING 12

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 12

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

UNIT V ADVANCED TECHNIQUES 10

Network Flow Problems – Transportation and Assignment Problems – Maximal flow Shortest Route Delphi Technique, Brain Storming, Neural Network – Application in Transportation Network Planning

TOTAL: 60 PERIODS

OUTCOME:

- Students would have understood the method of sampling and basics of statistical technique and to relate it to solve traffic and transportation issues.

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
6. George Argyrous, "Statistics for Research",2011, Sage Publications, London.

TE8103 TRAFFIC ENGINEERING DESIGN 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 – Geometric Design – An Overview

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 DESIGN OF TRANSPORT INFRASTRUCTURE 9

Sight Distance, Design of Cycle Tracks, Pedestrian Facilities, Parking Facilities – On Street, Off Street Multi level 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

OUTCOME:

- Students would be aware of the basic Principles and Design ,Planning and Management of Transportation system.

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

TE8104 TRANSPORTATION SYSTEMS PLANNING L T P C
3 0 0 3

OBJECTIVE:

- To impart knowledge in the rudiments and advancements in Transportation Planning and Travel Demand Forecasting

UNIT I TRANSPORTATION SYSTEM STATUS 9

Status of existing Transportation System – Systems Approach to Transport Planning - Interdependence of the Landuse and Traffic – Stages in Transportation Planning – Transport Systems and Planning Considerations.

UNIT II INVENTORIES AND SIMULATION MODELING 9

Concepts of Zoning – Transportation Surveys – Inventory of Transport and other activities – Travel Forecasting Process – Basics of Systems Simulation Modeling - Application in Travel Forecasting – Critical issues in Travel forecasting.

UNIT III FOUR STAGE MODELING PROCESS 9

Conventional and Four Stage Modeling Process – Trip Generation Models – Trip Distribution Models and Calibration – Methods of Trip Assignment Models –Multi Modal Trip Assignment – Mode Choice and Modal Split Models.

UNIT IV ADVANCED TRAVEL FORECASTING 9

Advanced Travel Demand Forecasting Methods - Activity Based Modeling – Comparison of Conventional and Activity Based Modeling – Integration of Systems Simulation Modeling and Transportation Network Planning for Sustainability.

UNIT V LAND USE TRANSPORT MODEL (LUT) 9

Accessibility Measures and Basic Theories – Lowry Derivatives Model- Garin Model –Approach and Simulation Modeling in LUT Model - Multimodal Transportation Planning.

TOTAL: 45 PERIODS

OUTCOME:

- Students would be aware of the Principles and Planning of Transportation Infrastructure.

REFERENCES:

1. John Khisty C, Kent Lall B, "Transportation Engineering – An Introduction, 3rd Edition, Prentice Hall of India, New Delhi, 2002
2. Papacostas C.S., Prevedouros, "Transportation Engineering and Planning, 3rd Edition, Prentice Hall of India, New Delhi, 2002
3. John D.Edwards (Edr.), "Transportation Planning Hand Book", 2nd Edition, Institute of Transportation Engineers, Prentice Hall Inc., Washington DC, USA, 1999
4. O'Flaherty C.A, "Transport Planning and Traffic Engineering", Elsevier Publications, New Delhi,1997.
5. Chennai Metropolitan Development authority (CMDA) (2006), Chennai Metropolitan Area – Second Master Plan, Chennai.

TE8111 PAVEMENT MATERIALS AND EVALUATION LABORATORY L T P C
0 0 4 2

OBJECTIVE:

- To give the students to hands on experience on the various testing procedures of pavement materials as per the IRC standards.

I PAVEMENT MATERIAL TESTING

- **Testing on Bitumen:**
- Specific Gravity of Bitumen.
- Penetration Test.
- Softening Point Test.
- Ductility of Bitumen.
- **Tests on Road Aggregates.**
- Specific Gravity of Aggregates.
- Los Angeles Abrasion Test.
- Aggregate Impact Test.
- Sieve Analysis, Flakiness and Elongation Index.

II TESTS ON BITUMINOUS MIXTURE.

- Design of Bituminous Mixes.
- Marshal Stability Test.

III PAVEMENT EVALUATION – ROUGHNESS AND DISTRESS EVALUATION

- Visual pavement condition survey - patches, potholes, ravelling, edge breaking and cracking.
- Skid resistance measurements.
- Texture Depth.
- MERLIN
- Benkelman Beam Deflection test.

TOTAL : 60 PERIODS

OUTCOME:

- The students on completion of the laboratory classes would have knowledge on properties and testing procedures of pavement materials.

TE8112 TRAFFIC SURVEYS AND ANALYSIS 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

OUTCOME:

- The students would have an understanding on conducting various types of traffic surveys involving data collection its analysis and the inference and way of presentation.

TE8201 MASS 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 – National Transport Policy

UNIT II PUBLIC TRANSIT SYSTEM 9

Urban Transport System – Public Transport System Re-genesis and Technology – Physical performance of Public Transport System – Public Transport and Urban Development Strategies - Characteristics of Rail Transit – Vehicle Characteristics, ITS

UNIT III BUS TRANSIT PLANNING AND SCHEDULING 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 TERMINALS AND PERFORMANCE EVALUATION 10

Performance Evaluation – Efficiency, Capacity, Productivity and Utilisation – Performance Evaluation Techniques and Application – System Network Performance – Transit Terminal Planning and Design

UNIT V IMPACT OF TRANSIT 10

Policies and Strategies for Mass Transport – Need for Integrated Approach – Unified Transport Authorities – Institutional arrangement – Urban Transport Fund – Parking Policies - Private Sector in Mass Transport – Bus and Rail Integration – Co-ordination of Feeder Services – Transit Oriented Land Use Development – Case Studies - 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

OUTCOME:

- The students would have knowledge on planning of various transit systems like bus and rail, their scheduling and management strategies.

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.

TE8202 ROAD SAFETY SYSTEM L T P C
3 0 0 3

OBJECTIVES:

- Helps in identifying the reasons for road accidents and scientific 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

OUTCOME:

- The students would have gained knowledge on different aspects of road safety audit and its methodology

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.

TE8203 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, Form of Urban Region, Managing the change, Integrated Planning, Sustainable Development

UNIT III THE URBAN BUILT-IN ENVIRONMENT 9

Urban Form, Land Use, Compact Development, Principles of street design- complete streets, Transport Integrated Urban land use Planning, , Guidelines for Environmentally sound Transportation

UNIT IV SUSTAINABLE TRANSPORTATION MODES PLANNING 11

Pedestrian – Planning Principles, Tools, Designs, Methods to measure success, Cycles- Planning Principles, Cycle Track Network, Crossings and intersections and junctions, Transit Planning, Road Side Infrastructure Planning

UNIT V TRAVEL AND TRANSPORT 10

Transport and Environment – Equity Principle, Accessibility, Mobility – Roads, Traffic, Public Transport, Business and Goods Traffic, Relationship to land use , Financing and Pricing – Economic Benefits of Sustainable Transportation

TOTAL: 45 PERIODS

OUTCOME:

- Students would have learnt the importance of sustainable urban and transport planning and its benefits to the human community.

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
5. Tumlin Jeffrey, "Sustainable Transportation Planning- Tools for Creating Vibrant", Healthy and Resilient Communities, John Wiley & Sons, 2012.

TE8204 TRANSPORTATION MODELING AND SIMULATION L T P C
3 0 0 3

OBJECTIVE:

- Offers basic and fundamental principles of Systems Approach and its application in simulating and modeling the complex and dynamic traffic and transportations systems.

UNIT I SYSTEMS APPROACH CONCEPT 9

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

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 – Principles of Systems and its Hierarchies.

UNIT III MODEL DEVELOPMENT AND SCENARIO ANALYSIS 10

System Dynamic Model Development - Flow Diagraming methodologies – Stocks and Rate Variable Concepts – Relevance of selection in Level and other auxiliary variables – Significance of Sensitivity Analysis in Simulation Modeling – Importance of Policy and Scenario Analysis.

UNIT IV MODEL VERIFICATION AND VALIDATION 7

Concepts of Model Verification – Model Calibration – Model Validation - Sensitivity and Dimensional Analysis – Methods of SD Model Validation – Comparison of Conventional Model Validation with Simulation Model Validation efforts.

UNIT V MODELING TRANSPORTATION SYSTEMS 10

Conventional Modeling – Computer Simulation Modeling efforts – Application to Traffic and Transportation Systems – Modeling of any traffic systems for service quality enhancement – Modeling of transport, energy and environment system interactions.

TOTAL: 45 PERIODS

OUTCOME:

- Students would have the knowledge in system Dynamics simulation Modeling efforts.

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", 3rd 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

TE8205 URBAN AND REGIONAL PLANNING L T P C
3 0 0 3

OBJECTIVES:

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

UNIT I BASIC CONCEPTS POLICIES AND PROGRAMMES 8

Definitions and Concept- Urbanization, Towns, Cities, Metropolis, Megalopolis, Satellite and New towns, CBD, Peri urban areas, Suburban areas, Census Definition, Classification of urban settlements, TOD, National policies, National Urban Transport Policy 2006, National Policy for Urban street vendors 2009- Programme objectives and salient features of Jawaharlal Nehru National Urban Renewal Mission (JNNURM), Urban infrastructure development scheme for small and medium towns (UIDSSMT), Rajiv Awas Yojana (RAY),

UNIT II PLANNING PROCESS 8

Steps in Planning Process- Plans; levels; objectives, content, and data requirement-regional plan, master plan, detail development plan, city development plan, development control regulation, Zoning Regulation, Layout and Building Regulations.

UNIT III SOCIO ECNOMIC AND SPATIAL PLANNING 10

Economic and social concepts in urban and regional planning and their relevance, Economic principals of zoning, Components of sustainable development, Inclusive development, Compact cities, Quality of life-Form of cities, issues related to inner city fringe areas, and suburban areas, Application of Remote sensing and GIS in Urban and Regional planning.

UNIT IV PROJECT FORMULATION AND EVALUATION 10

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

Urban infrastructure projects planning, appraisal, formulation, feasibility and preparation of detailed project report, site planning, layout, road network, and service ducts under the road, Environmental impact assessment, and Traffic assessment.

UNIT V URBAN GOVERNANCE AND MANAGEMENT 9

Planning laws; Town and Country planning act: Urban Development authorities Act, Constitutional (74^{th} Amendment) Act 1992- Local bodies, Functions, powers and Interfaces

TOTAL: 45 PERIODS

OUTCOMES:

- Students will be aware of various Acts, Policies and Programmes related to Urban Planning and Development.
- Students will be in a position to formulate, appraise and conduct feasibility studies on urban projects

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
6. Thooyavan. K.R, "Human Settlements – A Planning Guide to Beginners. M.A Publications, Chennai 2005.
7. Tumlin Jeffrey, "Sustainable Transportation Planning Tools for Creating Vibrant Healthy and Resilient Communities", John Wiley And Sons, 2012.

TE8211 CAD FOR TRANSPORTATION ENGINEERING L T P C
0 0 4 2

OBJECTIVE:

- Helps in formulation and evaluation of Transportation Engineering projects using softwares

LIST OF EXERCISES

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

i) Rotary Design
ii) Traffic signal Design
iii) Multi level / Surface level Parking Design

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iv) Public transport route evaluation
v) Transport Planning for a small area

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**

OUTCOME:

- The students would have gained knowledge on various Transportation software tools and their application in solving transportation problems on a real time basis.

TE8301 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 FLOW CHARACTERISTICS 10

Traffic Flow characterization – Categories of Traffic Flow – Macroscopic and Microscopic Traffic Flow Models – Centrally versus Individually controlled modes – Vehicular Stream Models - 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 QUEUING MODELS 8

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

UNIT IV TRAFFIC DELAYS 8

Delay at Intersections - Type of delays - Manual measurement – Saturated and oversaturated intersections – Arrival Pattern

UNIT V SIMULATION MODELS **9**

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

TOTAL: 45 PERIODS

OUTCOME:

- Students would have knowledge of Traffic Flow characteristics and the theory of Traffic Flow that would help them to develop an efficient transport system.

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", 3rd Edition, Prentice Hall of India, New Delhi,2002
5. Kadiyali, L.R, "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi,2006.

TE8302 TRANSPORT ECONOMICS **L T P C**
3 0 0 3

OBJECTIVE:

- Provides knowledge in economic evaluation and Public private partnership in developing road infrastructure projects and application of systems simulation techniques in modeling transport economic systems.

UNIT I ECONOMIC EVALUATION **9**

Need for Economic Evaluation of Urban Transport Projects – Principles of Economic Analysis – Methods of Economic Evaluation – Comparison of various methods – Application of Simulation Modeling in evolving suitable evaluation techniques – Sensitivity Analysis.

UNIT II MODELING OF ROAD USER COSTS **8**

Components of vehicle operating cost – Factors affecting vehicle operating cost – Value of Travel Time Saving - Accident Cost – Concept of Route Switching Mechanism. - Ripple effects in developing new infrastructure – Simulation Modeling exercise.

UNIT III TRANSPORT DEMAND SUPPLY CONCEPT **8**

Transport demand and supply concepts - Status of transport demand supply in metropolitan cities – Demand and Supply equilibrium - Subsidy in Transport demand – Supply augmentation and saturation consideration- simulation modeling of transport demand and supply for sustainability.

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 – Principles of Build, Operate and Transfer (BOT) –BOT variants and its applicability– Special Purpose Vehicles-Alternative Financial Resources.

TOTAL: 45 PERIODS

OUTCOME:

- Students would be equipped with the economic principles in dealing with transport supply and demand.

REFERENCES:

1. Robert F Baker, (eds), "Hand Book of Highway Engineering, Van Nostrand Reinhold Company, New York, 1975
2. Indian Roads Congress Standards (2002), "Economic Evaluation of Transport Projects", New Delhi.
3. John Khisty C, Kent Lall B, "Transportation Engineering – An Introduction, 3rd Edition, Prentice Hall of India, New Delhi, 2002
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.

TE8001	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

OUTCOME:

- The students would have gained knowledge the simulation techniques in System Dynamics Modeling in Transportation Engineering

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

TE8002 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

UNITII 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

OUTCOME:

- Students would have understood the basics of air route Planning, Network revenue Management.

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.
5. Norman.J.Ashford, Sakleh.A Mumayiz and Paul.H.Wright, "Airport Engineering Planning Design and Development of 21st Century Airports, John Wiley and sons, New Jersey, 2011.

TE8003 **ENVIRONMENTAL IMPACT ASSESSMENT OF TRANSPORTATION PROJECTS** **L T P C 3 0 0 3**

OBJECTIVE:

- 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 STANDARDS IN URBAN AREAS AND EIA 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 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 III ENVIRONMENTAL QUALITY AND MANAGEMENT 7

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 IV ENVIRONMENTAL MAINTENANCE AND LEGAL SYSTEMS 10

Impact of Traffic on Environment – Network Pattern, Urban Growth Indicators of Environmental Quality, Energy use, Fuel Economy in Transportation, Energy Efficiency strategies

UNIT V MITIGATIVE MEASURES AND POLICIES 8

Mitigative Measures for Air and Noise Pollution Policies and Strategies, Involvement of Stakeholders, Public Participation, Institutional Arrangements.

TOTAL: 45 PERIODS

OUTCOME:

- Students would have understood the impact of Transportation projects on the environment and to adopt mitigative measures in the planning stage.

REFERENCES:

1. Larry W Canter, "Environmental Impact Assessment", McGraw Hill Publishers, 1996.
2. RaoV.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.

TE8004 **INTELLIGENT TRANSPORTATION SYSTEMS** **L T P C 3 0 0 3**

OBJECTIVE:

- To expose the recent advancements in Transport Systems

UNIT I INTRODUCTION TO INTELLIGENT TRANSPORT SYSTEM 8

Definition – Role and Responsibilities – Advanced Traveller Information System – Fleet Oriented ITS Services – Electronic Toll Collection – Critical issues – Security - Safety

UNIT II ITS ARCHITECTURE AND HARDWARE 9

Architecture – ITS Architecture Framework – Hardware Sensors – Vehicle Detection – Techniques – Dynamic Message Sign – GPRS – GPS – Toll Collection

UNIT III INTERSECTION MANAGEMENT 10

Video Detection – Virtual Loop - Cameras - ANPR – IR Lighting – Integrated Traffic Management – Control Centre – Junction Management Strategies

UNIT IV ADVANCED TRANSPORT MANAGEMENT SYSTEM 10

ATMS – Route Guidance – Issues - Travel Information – Pre Trip and Enroute Methods – Historical – Current – Predictive Guidance – Data Collection – Analysis – Dynamic Traffic Assignment (DTA) – Components – Algorithm

UNIT V ADVANCED TRAVELLER AND INFORMATION SYSTEM 8

Basic ATIS Concepts – Smart Route System – Data Collection – Process – Dessemination to Travelers – Evaluation of Information – Value of Information – Business Opportunities

TOTAL: 45 PERIODS

OUTCOME:

- On completion of the course the students would have knowledge on the various Principles and Aspects of Intelligent Transport System.

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

TE8005 LOGISTICS IN TRANSPORTATION ENGINEERING L T P C
3 0 0 3

OBJECTIVE:

- Provides an understanding on Freight Transport, Modeling, Location of the Facility and its Management

UNITI LOGISTICS 7

Introduction – Trade Logistics Service, Freight Costs – Freight Demand Models

UNITII FREIGHT TRANSPORT 10

Econometric Models for Freight Forecasting – Input Output Models – Regional Network Systems – Graph Theory Application in Network Planning

UNIT III DISTRIBUTION MANAGEMENT 10

Supply Chain – Warehousing – Facility Location, Inventory – Mode Choice – Distribution System, Vehicle Routing and Scheduling

UNIT IV LOGISTICS MANAGEMENT 10

Logistics out sourcing – IT Application in Freight Logistics – Technology in Logistics Management – Intermodal Transportation

UNIT V ITS APPLICATION IN FREIGHT TRANSPORT 8

Commercial Fleet Management, Toll Plaza Analysis

TOTAL : 45 PERIODS

OUTCOME:

- Students will have a knowledge on the principles and practice of Freight Transport Modeling and provision of the Facilities

REFERENCES

1, Blanchard S.Benjamen, "Logistics Engineering and Management", Prentice Hall, Inc, Eaglewood Cliffs, New Jersey 07632, 1986
2, Coyle J.J.Bardi JE, "The Management of Business Logistics", West Publishing Company, New York, 1984
3. Daganzo F.C and Newell FG, Vol.19B, No.5, pp.397-407, Physical Distribution from a Warehouse; Vehicle Coverage and Inventory Levels, Transportation Research, 1985
4. Edwin Bacht J.A., "Geography of Transportation and Business Logistics", Wm C Brown Company Publishers, Dubuque, IOWA, 1970
5. Herron P.David, "Managing Physical Disribution for Profit", Harvard Business Review, 1979
6. Khanna K.K., "Physical Distribution Management", Logistical Approach, Himalaya Publishing House, Bombay, 1985
7. Planning Commission, Government of India, Total Transport System Study – Report on Commodity Flows, Railways, Highways and Coastal Shipping, (Interim) by RITES, New Delhi, 1987
8. Shapiro D. Roy and Heskett L.James, "Logistics Strategy-Cases and Concepts", Wesg Publishing Company, New York, 1985

TE8006 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 –Network and Project level of PMS - PMS functions- 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.

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UNIT IV PERFORMANCE PREDICTION MODELS 9

Techniques for developing prediction models – AASHO, CRRI and HDM models – computer applications – Identification of alternatives –deterioration modeling- priority programming Methods

UNIT V REHABILITATION 9

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

TOTAL: 45 PERIODS

OUTCOME:

- The students would have knowledge on the concepts of design, evaluation and performance of flexible and rigid pavements

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, AppliedScience Publishers Limited, London, 1975

TE8007 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 Fore casting - Case Studies

UNIT V RAILWAY INFRASTRUCTURE 9

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

TOTAL: 45 PERIODS

OUTCOME:

- The students would have gained knowledge on Rail Infrastructure Planning, Operation and Management.

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.

TE8008 REMOTE SENSING AND GIS IN TRANSPORTATION 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

OUTCOME:

- The students would have knowledge on the basics of Remote Sensing and GIS techniques and their application in the Transport sectors.

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.

TE8009 **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 considerations – 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

OUTCOME:

- On completion of the course, the students would have gained knowledge on various urban transport infrastructure facilities and their design.

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

TE8010 **WATERWAYS TRANSPORTATION SYSTEM – 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 – Traffic Management in Port Premises

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

OUTCOME:

- Students would have gained knowledge on various aspects of planning and design of Water Transportation Systems.

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