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SEMESTER II

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MTCE 2201	DCS	SYSTEM ANALYSIS AND URBAN TRANSPORTATION	2	1	2	4	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based on following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning out comes

1. Justify the need for urban transportation system planning
2. Plan the process of trip generation and distribution
3. Understand the four steps of urban transportation demand forecasting
4. Communicate transportation planning ideas effectively

Course Outcomes:

1. To understand principles and techniques of traffic forecasting.
2. To understand concept and purpose of trip generation.
3. To analyze different distribution models and assignment of model.
4. Understand economic analysis in urban transportation.

Syllabus:

UNIT I

Probability; statistics for traffic engineering design; Random variable and statistical measures; Basic concept of probability, probability laws, Binomial, Poisson, normal and exponential distributions

Sampling theory and regression analysis; General consideration of the accuracy; Cost and time requirements of data collection; Sampling theory and principles for determining sample size and accuracy relationship; Principles of the population mean and standard deviation; Regression analysis examples

UNIT II

Traffic forecasting: Principles and techniques; Demand, price and capacity relationships; Price elasticity; Forecasting for long term demand, variables; Determination of the design hourly volume; Planning methods of transport system planning, stages of planning; Transportation study area, and collection of travel data; External cordon and screen-line; Survey, zoning types of surveys

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SEMESTER II

UNIT III

Trip Generation Models: Introduction and definition; Factors governing trip generation; Multiple linear regression analysis; Aggregated and disaggregated analysis; Category analysis.

UNIT IV

Distribution Models: Methods of trip distribution; growth factor models, gravity model, tanner model, intervening opportunity model, competing opportunity model

Assignment models: General principle; Assignment techniques, all or nothing assignment, multiple route assignment, capacity restraint assignment; Diversion curves.

UNIT V

Economic analysis: Need, costs and benefits, time horizon in economic assignment; Basic principles; Methods of economic evaluation; Traffic and the environment; Effects of traffic on the environment

Text Books:

1. Kadiyali L.R., Traffic Engineering and Transport Planning, Khanna Publication
2. Martine Wool and Brain V. Martin, Traffic System Analysis, McGraw Hill Text

Reference Books:

1. Hutchinson B.G., Principles of UTS Planning, Mc Graw-Hill Publish.
2. Saxena, Traffic Planning and Design, CBS Publishers & Distributors.

List of Practical's

1. Study area delineation & travel survey design
2. Home interview survey and data analysis
3. Calibration of trip generation models
4. Calibration of singly / doubly constrained gravity models
5. Calibration of utility based mode choice models
6. Trip assignment by AoN / CRMethod / Multipath/ Equilibrium methods

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COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MTCE 2202	DCS	TRANSPORTATION PLANNING	2	1	2	4	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be on based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. Basic understanding of what transportation planning is, its theoretical backgrounds and applications
2. Ability to understand the important concepts about public transport system

Course Outcomes:

1. To introduce the issues of transportation planning and transportation policy
2. To introduce travel survey method for understanding travel behavior
3. To introduce the key concepts of the urban transportation planning system
4. To introduce the fundamental concepts of public transport system such as system, technology and quality of service

Syllabus:

UNIT I

Transportation in Society: Role of transportation (Land, air, water) in civilization, economic, social, political; Environmental roles of transportation today in India

UNIT II

Fields of Transportation Engineering: Different fields involved system planning; Scientific approach to model development; Science and professional judgment in organizations

Component of Transportation System: Transport technology, transportation systems, transportation network and their analysis; Vehicle and containers

UNIT III

Vehicle Motion: Equations of motion, resistances, path characteristics, prediction of vehicle performance; Generalized vehicle performance relationships; Work, energy and fuel consumption

Continuous Flow System: General characteristics, belt conveyors, pipe lines, capsule pipe lines, concepts of flow and design

Terminals: Functions, analysis, process flow charts, terminal processing time, waiting times, capacity and level of service concepts; Simulation probability; Density functions; Queuing theory, passenger and freight terminals, air, bus, railroad

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SEMESTER II

UNIT IV

Transport Costs, Demand and Supply: Concepts, types, future costs and present value; treatment of inflation; cost estimating methods; choice of technology and cost output relationships; demand function, demand models, urban travel forecasting model, demand for freight transportation; Projection techniques; Theory of transport supply, supply characteristics of transport facilities, pricing, supply characteristics, O carriers, supply relationships for an urban transit time.

Transportation Network Flows: Merging of demand and supply relationships; Economic market equilibrium and extension to include level of service, network equilibrium traffic assignment.

UNIT V

Environment impacts: Noise impact; air pollution; evaluation procedures; situation in India.

Decision making: Characteristics of transportation problems, problem solving process; Multiple objective evaluation and selection methods, selection procedures; Economic evaluation methods; Long range transportation planning; Types of planning process; Data base, alternatives and their generation; Operation plans, system operation and management; Network relationships, TSM; Management scheme for reducing congestion in CED and on streets; Reducing travel peaks, traffic Engg. Measures; Road Traffic models for CBD, corridor operation planning, maintenance; integrated operation planning and design of a system, Implementation; Urban transportation legislation, legal powers, financing

Text Book:

1. Edward K. Morlok, Introduction to Transportation Engineering an Planning, Mc Graw Hill Book Co.
2. John W. Dickey, Metropolitan, Transportation Planning, Mc Graw Hill Co.
3. Kadiyali L.R., Traffic Engineering and Transportation Planning, Khanna Publication, Delhi.

References Books:

1. Wohl, Martin and Brien V.Martin, Traffic System Analysis for Engineers and Planners, Mc Graw Hill Book Co.
2. Hutkinson, Bruce D., Principles of Urban Transport System Planning, Mc Graw Hill.

List of Practical's

Formulation and evaluation of the following Transportation Projects

1. Rotary Design
2. Traffic signal Design
3. Multi level / Surface level Parking Design
4. Public transport route evaluation
5. Transport Planning for a small area

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							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MTCE 2203	DCS	DESIGN AND CONSTRUCTION OF RIGID PAVEMNT	2	1	0	3	60	20	20	0	0

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be on based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To study the behavior of pavements under various loads
2. To design the flexible and rigid pavements using different Empirical, semi-empirical and theoretical approaches
3. To understand the concept of Pavement Management System, pavement failures and its evaluation

Course Outcomes:

Upon completion of this course, the students should be able to:

1. Know the stresses, strains and deflections in rigid and flexible pavements; traffic loading; and material characterization.
2. Design methodologies for both rigid and flexible pavements
3. Understand the structural and functions failure and the evaluation of pavements

UNIT I

Theories of Design of Rigid Pavements: Westergaard's analysis; Picket's Solution, Westergaard's formula for loads on applied area; Finite difference method, linear elastic layer method, finite element method; Deflection in rigid pavements

Design of Concrete Pavements: ESWL for rigid pavements; Load stresses and temperature stresses; Effect of repetition of loads, Concepts of stress ratio, IRC design methods as per revised code; PCA chart method; Reinforcement design in CC pavement; Design of airfield pavements

UNIT II

Pavement Joints: Need of joints, Different types of joints, Contraction and warping joints; Design of dowel bars and tie bars; Filling and sealing materials of joints

UNIT III

Continuously Reinforced Concrete Pavements: Width and thickness of slab; Reinforcing steel design construction criteria, factors affecting; Crack width and spacing of CRC pavements; Design of CRC pavement for highway and airfield.

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SEMESTER II

UNIT IV

(A)Design of Prestressed Concrete Pavements: Stresses in pavements; Thickness design and pre-stressing techniques, precast prestress CC pavement slab, advantages and constructions

(B)Evaluation and Strengthening: Performance evaluation, safety, serviceability and durability concepts; Design of rigid overlays on rigid pavements and flexible pavement, FRC overlays; Construction and maintenance.

UNIT V

Construction of Rigid Pavements: Formwork, mixing, spreading, compaction and finishing, slip form pavers, Quality Pavement concrete (QPC)

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Text Book:

1. H.M.S.O. Concrete Road, Design and Construction.
2. Yodar E.J., Principle of Pavement Design, Wiley India Pvt Ltd; Second edition

References Books:

1. IRC-18-1981, Standards, Specifications and Code of Practice for Construction of Concrete Roads.
2. IRC-58-1988, Guidelines for the design of Rigid Pavements for Highways.
3. IRC SP-49-1988, Guidelines for the use of Dry Lean Concrete as Sub Base for Rigid Pavements.
4. IRC-15, Standard Specification and Code of Practice for Construction of Concrete Roads.
5. IRC-44-1976, Tentative Guidelines for CC Mix Design for Pavements.
6. IRC-SP-46, 1977, SFRC for Pavement.
7. Sharma S.K., Principle Practice & Design in Highway Engineering.

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							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MTCE 2204	DCS	ANALYSIS AND PLANNING OF MASS TRANSPORTATION SYSTEM	2	1	0	3	60	20	20	0	0

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:
Student will able to understand planning in urban transport, economic evaluation, network planning and development of mass transportation.

Course Outcomes:

1. To understand different aspects in planning of urban transport
2. To analyze the key factors in economic evaluation of transportation system.
3. To design bus route network planning system.
4. To understand the development of mass transportation.

Syllabus:

UNIT I
Urban Transportation Planning: Terms, problems, issue process; Inventories, goals and plans: Measures to meet problems; UTP models; Generation, distribution, modal split; Route Assignment; Urban vs. rural development.

UNIT II
Data Collection and UTP: Reasons, sampling, kinds, methods of collection; Processing, population and land use, forecasting; Surveys – HIS, RIS, VKTS, PKTS; Network inventory, O-D; Application of IT.
Economic Evaluation Transportation Proposal Methods: IRR, NPV, B/C, ROR, Comparison of methods; Relation between flow, speed and travel cost.

UNIT III
Mass Transportation Demand Estimation: Choice of public mass transport, Factors related to mass transport and commuter behaviour; Regression models; Diversion curves, Multinomial log it model; Basic approaches for modal split; TEM and TIM

UNIT IV
(A)Bus Route Network Planning: Different system of bus network generation; Activity intensity System; Demand direction.

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(B)Bus Scheduling and Terminal Design: Marginal ridership concepts; Data required; Allocation on each route, Fixing of bus fare; Terminal facilities required; Site exploration; space requirement; Pattern bus depot

UNIT V

Taxonomy of Transportation system and Development of Mass Transportation: Complete transportation package for urban area network, vehicle terminal, control system; Efficiency of modes; BRTS; Justification and economic evaluation demand; Scheduling, number of buses, planning of bus stops, spacing ,ETB, Charted buses, Dial-o-Bus, RRT, LRT, Para transit; Automated Highway ; Monorail , Mini rail.

Text Books:

1. Verma and T.V. Ramanayya, Public Transport Planning and Management in Developing Countries, CRC Press,2014
2. Vuchic Vukan R. ,Urban Transit :Operations ,Planning and Economics, Prentice Hall,2005

Reference Books:

1. Grey G.E. ,and Hoel L.A., Public Transportation, Prentice Hall,1992

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							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MTCE 2205(1)	DCS	DESIGN AND CONSTRUCTION OF FLEXIBLE PAVEMENT	2	1	0	3	60	20	20	0	0

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To study the behaviour of pavements under various loads
2. To design the flexible and rigid pavements using different Empirical, semi-empirical and theoretical approaches

Course Outcomes:

Upon completion of this course, the students should be able to:

1. Know the stresses, strains and deflections in flexible pavements; traffic loading; and material characterization.
2. Design methodologies for flexible pavements
3. Understand the structural and functions failure and the evaluation of pavements

Syllabus:

UNIT I

Equivalent single wheels load concepts and applications, relationship between wheel arrangements and loading effects, tyre contact area, effect of load repetition, effect of transient loads, impact of moving loading, factors to be considered in design of pavements, design wheel load, soil, climatic factors, pavement component materials, environmental factors, special factors such as frost, freezing and thawing

UNIT II

Design of Flexible Pavements: Methods of design, empirical, semi empirical and analytical, Group index, CBR, California resistance value, Triaxial, MCleod, Burmister and F.A.A. method, IRC method as per revised code using computer software; Design of flexible pavement for airfields

UNIT III

Construction of Flexible Pavements: Type of highway construction, earth road and gravel roads, soil stabilized roads, W.B.M. roads, black top roads, seal coat, prime coat and tack coat, premix, bituminous construction procedures: surface dressing, grouted macadam, bitumen bound macadam, bituminous carpet, Benkelman beam method, pavement roughness and pavement strength, fracture patterns and disintegration, present serviceability of pavement system and cost analysis, optional selection of flexible pavement component.

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SEMESTER II

UNIT IV

Design of Bituminous Concrete Mix: Principles of mix design, factors, method, Marshall, Habber and Field, Hveem, Triaxial, comparison of different methods.

UNIT V

Strengthening of Pavement: Types of failure, remedial measurement, pavement evaluation methods using Deflectometer, Benkelman beam as per IRC code

Text Book:

1 Sharma S.K., Principle Practice and Design of Highway Engineering, S Chand & Company, 2014
2 Kadiyali L.R., Highway Engineering, Khanna Publication
3 Kadiyali L.R., Principles of Highway Engineering, Khanna Publication

References Books:

1 IRC Special Publication 19-1977, Manual for Survey Investigation and Preparation of Road Project.
2 IRC Special Publication 20-1979, Manual for Route Location, Design Construction and Maintenance of Rural Highways.
3 IRC-73-1980, Geometric Design Standards for Rural Highways.
4 IRC-52-1970, Design Tables for Horizontal Curves for Highways.
5 IRC-52-1973, Recommendation about the Alignment Survey Geometric Design of Hill Roads.

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							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MTCE 2205(2)	DCS	AIRPORT PLANNING AND DESIGN	2	1	0	3	60	20	20	0	0

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

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Course Outcomes:

Upon completion of the course, students should be able to:

1 Understand the aviation system and its functions
2. Know the airport planning process
3. Conduct studies for the various elements of an airport master plan
4. Plan and design basic airport facilities such as runways, taxiways, etc.

Syllabus:

UNIT I

Aircraft Characteristics: Landing gear configurations, aircraft weight, engine types. Atmospheric conditions affecting aircraft performance: air pressure, temperature, wind speed and direction. Aircraft performance characteristics: speed, payload and range, runway performance, declared distances, wingtip vortices.

UNIT II

Air Traffic Management: Air traffic separation rules, vertical separation, flight altitudes, longitudinal separation and lateral separation. Navigational aids, ground based systems, satellite based systems.

UNIT III

Airport Planning and Forecasting: Airport planning studies, airport system plan, airport site selection, airport master plan, airport project plan, forecasting methods, time series method, market share method, econometric modelling, forecasting requirements and applications: airport system plan, airport master plan.

UNIT IV

Geometric Design of the Airfield: Airport classification, utility airports, transports airports, runways, runway configurations, runway orientation, wind rose, estimating runway length, sight distance and longitudinal profile, transverse gradient, airfield separation requirements, obstacle

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clearance requirements. taxiways and taxi lanes: widths and slopes, taxiway and taxi lane separation requirements, sight distance and longitudinal profile, exit taxiway geometry, location of exit taxiways, design of taxiway curves and intersections, end-around taxiways.

UNIT V

Aprons: holding aprons, terminal aprons and ramps, terminal apron surface gradients, Control tower visibility requirements. Structural Design of Airport Pavements: Soil investigation and evaluation, CBR, plate bearing test, Young's modulus, effect of frost on soil strength, sub grade stabilization, FAA pavement design methods: equivalent aircraft method, cumulative damage failure method

Text Book:

1 Airport Engineering –Rangwala Charotar Publication.

References Books:

1. Airport Engineering: Planning, Design, and Development of 21st Century Airports, Norman J. Ashford , Saleh Mumayiz , Paul H. Wright

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SEMESTER II

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MTCE 2205(3)	DCS	GEOMETRIC DESIGN OF TRANSPORTAITON FACILITIES	2	1	0	3	60	20	20	0	0

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

To provide knowledge in transportation so that students can understand and be able to solve transportation related problems and design for highway mode of transportation with focus on highway users' characteristics, geometric and pavement design, traffic engineering, and transportation planning

Course Outcomes:

Upon completion of this course, the students should be able to:

1 Understand the concept of capacity
2 Conduct traffic surveys
3 Design the links and intersections
4 Build safety into every aspect of design

Syllabus:

UNIT I

Geometric design provisions for various transportation facilities as per AASHTO, IRC and other guidelines, discussion of controls governing geometric design, route layout and selection

UNIT II

Digital image processing: Satellite image – characteristics and formats, image histogram, introduction to image rectification, image enhancement, land use and land cover classification system.

UNIT III

Vertical alignment – grades, crest and sag curves, highway cross – sectional elements and their design for rural highways, urban streets and hill roads.

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UNIT IV

Grade intersections – sight distance consideration and principles of design, Channelization, mini round– abuts, layout of roundabout, Inter – Changes – major and minor interchanges, entrance and exit ramps, acceleration and deceleration lanes, Bicycle and pedestrian facility design.

UNIT V

Parking layout and design and terminal layout and design

Text Book:

1 Bernhardsen, "Geographic Information Systems, an Introduction", 3rd Edition, Published by John Wiley Sons, 2006.

2 Lilles and T.M. and Kiefer R.W. "Remote Sensing and Image Interpretation", 5th Edition John Wiley and Sons, 2008.

3 Peter A Burrough, "Principles of Geographical Information Systems", 1st Edition, Oxford publisher, 1998.

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