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SCHEME OF EXAMINATION

& SYLLABUS

of

M.Tech Civil

(Highway Engineering)

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SEMESTER - I

Cours No.	Subject	Hrs / Week			Internal Marks	End Semester Exam.valuation Scheme (Marks)		Credits
		L	T	P		Marks	Duration (Hrs)	
1MTHE01	Highway Infrastructure design	3	1	0	40	60	3	4
1MTHE02	Traffic engineering	3	1	0	40	60	3	4
1MTHE03	Pavement analysis and design	3	1	0	40	60	3	4
1MTHE04	Urban Transportation Planning	2	1	0	40	60	3	3
1MTHE05	Highway Engineering Lab – I	3	1	0	60	40	3	2
	Total (500)				220	280		20

SEMESTER -II

Course No.	Subject	Hrs / Week			Internal Marks	End Semester Exam.valuation Scheme (Marks)		Credits
		L	T	P		Marks	Duration (Hrs)	
2MTHE01	Highway Project Formulation and Economics	3	1	0	40	60	3	4
2MTHE02	Pavement Construction, Maintenance & Management	2	1	0	40	60	3	3
2MTHE03	Traffic Analysis	2	1	0	40	60	3	3
2MTHE04	Pavement Material Characterization	2	1	0	40	60	3	3
2MTHE05	Highway Engineering Lab - II	0	0	4	60	40	0	2
	Total (500)				220	280		18

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SEMESTER – III

Course No.	Subject	Hrs / Week			Internal Marks	End Semester Exam. valuation Scheme (Marks)		Credits
		L	T	P		Marks	Duration (Hrs)	
3MTHE01	Concrete Technology	2	1	0	40	60	3	3
3MTHE02	Communication & Research Methodology	2	1	0	40	60	3	3
3MTHE03	Seminar	0	0	2	--	100	0	2
3MTHE04	Dissertation Part-I	0	0	2	--	200	0	2
	Total=500				80	420		

SEMESTER – IV

Course No.	Subject	Hrs / Week			Internal Marks	End Semester Exam. valuation Scheme (Marks)		Credits
		L	T	P		Marks	Duration (Hrs)	
4MTHE01	Dissertation Part-II	0	0	21		400	0	12
	Total (400)					400		12

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SEMESTER-I

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1MTHE0 (Highway Infrastructure Design)

Course Objectives and outcomes

On completion of the course, the student would have gained knowledge of highway design & traffic analysis.

Unit-I

Highway Cross Section Elements and Geometric Design of Highways: Functional Classification of Highway System; Design Controls–Topography, Driver characteristics, Vehicle Characteristics, Traffic, Capacity and Level of Service, Design Speed. Objectives of Geometric Design. Carriageway, Shoulders, Formation, right of way; Kerbs, foot paths, Medians- design specifications; Pavement Surface characteristics – Skid Resistance, factors affecting Skid resistance, Measurement of Skid Resistance; Road Roughness, measurement of Road roughness; Camber, Objectives of Camber, design standards.

Unit-II

Horizontal and Vertical Alignment: Objectives of horizontal curves; Super elevation – Need for Super elevation; Method of computing super elevation; Minimum Radius of Curve; Methods of attainment of super elevation; Extra widening on Curves; Transition Curves –Objectives and Design. Gradients –Types of Gradients, Design Standards; Vertical Curves – Summit Curves, Valley Curves and Design criteria for Vertical Curves; Combination of Vertical and Horizontal Curves – Grade Compensation; Sight Distances –Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Importance of Sight Distances for Horizontal and Vertical Curves.

Unit-III

Intersection Design: Types of Intersections; Design Principles for Intersections; Design of At-grade Intersections–Channelization, Objectives; Traffic Islands and Design standards; Rotary Intersection – Concept, Advantages and Disadvantages; Grade separated Interchanges – Types, warrants and Design standards, **Auxiliary lanes, Median openings – control radii, lengths, skew, Roundabouts**

Unit-IV

Traffic Signs and Road Markings: Types of Road Signs; Guidelines for the provision of Road Signs; Cautionary Signs, Regulatory Signs, Information Signs–Design standards; Road markings–Objectives of Road Markings; Types of Road Markings; Role of Road markings in Road Safety and Traffic Regulation; Specification for Road Markings. Highway Appurtenances– Delineators, Traffic Impact Attenuators, Safety Barriers.

Unit-V

Miscellaneous Elements: Requirements of Pedestrians; Pedestrian facilities on Urban Roads**; Miscellaneous considerations – pedestrians, traffic control, frontage roads,** Cycle Tracks – Guidelines and Design standards; Bus bays – Types and Guidelines; Design of On - street and Off-street Parking facilities – Guidelines for lay out Design,

References:

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

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1MTHE02 (Traffic Engineering)

Course Objectives and outcomes: -

To impart knowledge in traffic flow characteristics, flow modeling & computer simulation. Student would have gained knowledge on traffic flow that would help them to develop an efficient transport system

Unit-I.

Traffic Characteristics Measurement and Analysis: Basic traffic Characteristics - Speed, Volume and Concentration. Relationship between Flow, Speed and Concentration. Traffic Measurement and Analysis - Volume Studies- Objectives, Methods; Speed studies – Objectives, Definition of Spot Speed, time mean speed and space mean speed; Methods of conducting speed studies; Presentation of speed study data; Head ways and Gaps; Critical Gap; Gap acceptance studies.

Unit-II

Highway Capacity and Level of Service: Basic definitions related to capacity; Level of service concept; Factors affecting capacity and level of service; Computation of capacity and level of service for two lane highways, Multilane highways and freeways,

Unit-III

Parking Analysis and Traffic Safety: Types of parking facilities – On - street parking and off – street Parking facilities; Parking studies and analysis - Parking Inventory Study, Parking Usage Study by Patrolling, Questionnaire Survey, Cordon Surveys; Evaluation of parking parameters; Parking accumulation, Parking Load, Parking Turnover, Parking Index, Parking Volume. Traffic Safety - Accident studies and analysis; Causes of accidents - The Road, The vehicle, The road user and the Environment; Engineering, Enforcement and Education measures for the prevention of accidents.

Unit-IV

Traffic Control, Regulation Signal Coordination: Traffic Signals – Types of Signals; Principles of P hasing; Timing Diagram; Design of Isolated Traffic Signal by Webster method, Warrants for signalization. Signal Coordination - Signal Co -ordination methods, Simultaneous, Alternate, Simple progression and Flexible progression Systems.

Unit-V

Traffic And Environment: Detrimental effects of Traffic on Environment, Air pollution; Noise Pollution; Measures to curtail environmental degradation due to traffic, **Vehicular Noise Pollution: Its Environmental Implications and Strategic Control**

References:

1. Traffic Engineering and Transportation Planning– L.R. Kadiyali, Khanna Publishers.
2. Traffic Engineering- Theory & Practice- Louis J.Pignataro, Prentice Hall Publication.
3. Principles of Highways Engineering and Traffic Analysis -Fred Mannering & Walter Kilareski, John Wiley & Sons Publication.
4. Transportation Engineering – An Introduction - C.Jotin Khisty, Prentice Hall Publication
5. Fundamentals of Transportation Engineering - C.S.Papacostas, Prentice Hall India.
6. I.T.E. Traffic Engineering Hand Book.

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1MTHE03 (Pavement Analysis and Design)

Course Objectives and outcomes: -
The students are expected to understand the properties & use of various material & construction, analysis of stress distribution, evaluation & maintenance of flexible & rigid pavement.

Unit-I

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

Unit-II

Stresses in Flexible and Rigid Pavements: Vehicle - Pavement Interaction: Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements. Stress In Flexible Pavements – Visco - Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two- and Three-Layered Systems, Fundamental Design Concepts. Stresses In Rigid Pavements - Vestergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars

Unit-III

Material Characteristics: CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilization and Use of Geo Synthetics.

Unit-IV

Design Of Flexible and Rigid Pavements: Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations, AASHTO, IRC Methods. Design Of Rigid Pavements - Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design, Rigid Pavement Design for Low Volume Rural Roads.

Unit-V

Design Of Overlays **& Drainage:** Types & Design of Overlays: AI's Principal Component Analysis & IRC Methods of Overlay Design, Importance of Profile Correction Course; **Pavement Drainage Concepts, Drainage Related Failures, Inflow-Outflow Concepts, Condition of Continuity, Surface and Sub Surface Drainage Design Specifications.**

References:

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

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1MTHE04 (Urban Transportation Planning)

Course Objectives and outcomes: -

Student would have gained knowledge about the urban area like how to develop the rural area, to improve particular area and data calculation for particular developing area

Unit-I

Urban Transportation Problem Travel Demand: Urban Issues, Travel Characteristics, Evolution of Planning Process, Supply and Demand – Systems approach. Travel Demand: Trends, Overall Planning process, long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

Unit-II

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

Unit-III

Four Stage Demand Forecasting: UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates. Trip Distribution: Growth Factor Methods, Gravity Models, Opportunity Models, Time Function Iteration Models.

Unit-IV

Mode Choice and Traffic Assignment:

Mode Choice Behaviors, Competing Modes, Mode Split Curves, Models and Probabilistic Approaches. Traffic Assignment: Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, all –or -Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment, Diversion Curves.

Unit-V

Plan Preparation and Evaluation: Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis

References:

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

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Elective-I

MTHE105A (Applied Statistics)

Course Objectives and outcomes: -
Students would have the knowledge about the mathematical applications of statistics, probability in various parts of highway engineering like forecasting the required numerical data in transportation sector.

Unit-I

Introduction & Sampling Techniques: Frequency distribution; Mean; Standard deviation; Standard error, Skewness; Kurtosis; Definitions and Applications; Simple random sampling; Stratified sampling; Systematic sampling; Sample Size determination; Applications in Traffic Engineering,

Unit-II

Statistical Distributions and Probability: Binomial, Poisson, Exponential and Normal distributions; Fitting of distributions; Mean and variance; Chi - square test of goodness – of - fit; Applications in Traffic Engineering. Probability - Laws of Probability; Conditional probability and independent events; Laws of expectation.

Unit-III

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

Unit-IV

Multi Variate Data Analysis and Exact Sampling Distributions: Types of data; Basic vectors and matrices; Simple estimate of centroid, Standard deviation, Dispersion, Variance and covariance; Correlation matrices; Principal component analysis; Time series analysis. Exact Sampling Distributions
- Chi - square distribution; Students T - distribution; Snedectors F - distribution.

Unit-V

Tests Of Significance & Confidence Interval –I& II: Large sample and small sample tests; Tests for single mean, Means of two samples, Proportions, two variances, two observed correlation coefficients, paired
T - tests, Applications. Tests Of Significance & Confidence Interval –II – Intervals for mean, variance and regression coefficients; Applications in Traffic Engineering problems.

References:

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

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MTHE105B (Project Management)

Course Objectives and outcomes: -:

To impart knowledge of activities that accurately forecast project cost, timelines and quality improvement process for successful resources, communication and risk and change management

Unit-I

Introduction to Project Management: A systems Approach, Systems Theory and Concepts, Organization, Management Functions, Overview of Management Objectives, Tools and Techniques, Project Management– Processes and Organizational Structures –Team Management – Project Manager as a Team Leader – Leadership Qualities, PMIS

Unit-II

Construction Cost and Value Engineering: Types of Estimates, Implementation of Cost Controls, Project Cost Forecasting, Cost Optimization and Resources Planning - Value Engineering, Techniques for Project Selection, Break - Even Analysis, Cost Modelling, Energy Modelling, Life Cycle Cost Approach.

Unit-III

Contract Management Safety in Construction Industry: Tendering and Contracting, Laws of Contracts, subcontracts, Potential Problems, Post Contract Problems, Documents, Conditions, Arbitration, Special Features of International Contracts. Quality Management and Safety in Construction Industry - Quality control by statistical methods, sampling plan, control charts, ISO 14000, Safety Measures, Safety Programmes, Safety Awareness and Implementation of Safety Plan – Compensation

Unit-IV

Project Scheduling and Analysis Methods: CPM, PERT, Linear programming, queuing concept, simulation, bidding models, game theory.

Unit-V

Human Resource Management and Construction Management Practices: Man Power Planning – Training – Motivation – Industrial Relations – Welfare Measures – MIS – Components and Structure – Personal Management. Resource Management and Inventory - Basic concepts, labour requirements & productivity, non – productive activities, site productivity, equipment and material management, inventory control. Construction Management Practices - Implementation of Procedures and Practices – International Experiences – Case Studies – Examples.

References:

1. Herold Kerzner - Project Management - A systems approach to Planning, Scheduling and Controlling. CBS Publishers and Distributors.
2. K.Waker A Teraih and Jose M.Grevarn; Fundamentals of Construction Management and Organisations.
3.Anghel Patterson - Construction Cost Engineering Handbook - Marcel Dekken Inc.
4. Dell Isola- Value Engineering in Constr uction Industry, Van Nostrand Reinhold Co.,
5.Choudhary, S. Project Management, Tata McGraw Hill Publishing Co., Ltd.,
6.Raina UK, Construction management Practices, Tata Mc Grawhill Publishing Company Ltd.
Sengupta B and Guha H, Construction Management and PlX`X`anning, Tata McGraw - Hill Publishing Company Limited, New Delhi

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MTHE105C (Bridge Engineering)

Course Objectives and outcomes: -
To impart knowledge of mechanics of various kinds of bridges and its sub structure.

Unit-I

Concrete Bridges: Introduction-Types of Bridges- Economic span length- Types of loading-
Dead load-live load- Impact Effect -Centrifugal force-wind loads-Lateral loads- Longitudinal forces - Seismic loads - Frictional resistance of expansion bearings - Secondary Stresses - Temperature Effect - Erection Forces and effects - Width of roadway and footway – General Design Requirements.

Unit-II

Solid slab, Girder Bridges & Continuous Bridges: Introduction - Method of Design. Girder Bridges – Introduction - Method of Design - Courbon's Theory. Continuous Bridges – Introduction - Span lengths - Analysis of Continuous bridges - Decking of Girders with constant Moment of Inertia - Continuous bridges with variable Moment of Inertia- Method of Analysis
- Girders with Parabolic Soffit - Method of plotting Influence lines - Girders with Straight Haunches – Design steps for Continuous Bridges.

Unit-III

Pre - Stressed Concrete Bridges: Basic principals - Method of Pre – stressing - Pretensioning and Post – tensioning – Comparision - Freyssinet Method –Magnel - Blanet System – Lee - Mc call system - Basic Assumptions - Losses in Prestress - Equation based on Initial and final stress conditions - Cable Zone - Design of selections - Condition of first crack - Ultimate load design - Shear – Vertical Prestressing - Diagonal Tension in I-section -End Block - Magnel's method - Emperical Method - General Design requirements - Mild steel reinforcement inprestessed concrete member -Concrete cover and spacing of pre-stressing steel-Slender beams-Composite Section-Propped - Design of Propped Composite Section - Unproped composite section-Two- stage Prestressing - Shrinking stresses - General Design requirements for Road Bridges.

Unit-IV

Analysis of Bridge Decks: Harmonic analysis and folded plate theory – Grillageanalogy - Finite strip method and FEM.

Unit-V

Sub-srtucture of bridges:Substructure - Beds block – Piers - Pier Dimensions - Design loads for piers – Abutments - Design loads for Abutments.

References:

1. Design of Concrete Bridges by M.G.Aswani, V.N.Vazirani and M.M.Ratwani.
2. Bridge Deck Behaviour by E.C.Hambly.Concrete Bridge Design and Practice by V.K.Raina

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MTHE106-P (Highway Engineering Lab – I)

Course Objectives and outcomes

On completion of the course, the student would have gained knowledge of highway design & traffic analysis

1. Test on soil – i) Soil Consistency test, Sieve Analysis
ii) CBR test
iii) Compaction of Soil
iv) Standard Proctor test

2. Test on Aggregate – i) Shape test
ii) Impact and crushing tests on aggregate
iii) Abrasion and Attrition test
iv) Soundness test

3. Tests on Bitumens – i) Viscosity, Penetration, Ductility tests
ii) Flash and fire point tests
iii) Rolling thin film test, Bitumen extraction tests

4. Test on Bitumen & Concrete mix – i) Design of Cement Concrete Mix for Highway
ii) Marshal Stability Mix Design

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SEMESTER II

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2MTHE 01 (HIGHWAY PROJECT FORMULATION & ECONOMICS)

Course Objectives and outcomes:-

A. To learn about sub grade preparation
B. To learn about economics and base course
C. to learn about Highway development
D. to learn about various aspects for project approval

Unit I:

Project Formulation: Requirements in project formulation, Criteria fixation, Components of project, Non-monetary and monetary Criteria in formulation of project, Decision making Criteria input in Project formulation. Preparation of DPR - Guidelines

Unit II:

Transport Projects Formulation and Economic Evaluation of Transportation Plans : - development of cash flow diagrams, Cost and benefit components, Discounting criteria, Preparation of Project, Highway Planning, Traffic infrastructure, Project formulation, Road Network project development - Economic evaluation of Transportation plans; Need for EconomicEvaluation; Principles of economic evaluation; Welfare economics; Social costs, Vest change, Rate of return.

Unit III:

Value of Travel time Savings and Accident Costs : Economic concept of evaluation of traveltime savings; Issues connected with evaluation of travel time savings. Vehicle operating costs; Components of VOC, Road User Cost study in India.- Accident costs; Methodologies for economic evaluation of an accident ; Factors involved.

Unit IV:

Basic methods of economic analysis and Project Appraisal : Equivalent Uniform Annual CostMethod; Present worth of cost method; Equivalent uniform annual net return method; Net present value method; Benefit cost ratio method; Rate of Return Method. Applications of these methods to highway projects. - Project appraisal by shadow pricing with case studies.

Unit V:

Environmental impact assessment: Basic Concepts, Objectives, Transportation Related Environmental Impacts – Vehicular Impacts – Safety and Capacity Impacts – Roadway Impacts– Construction Impacts, Environmental Impact Assessment – Environmental Impact Statement,Environment Audit, Typical case studies.

References:

1. Transportation Engineering Economics - Heggie. I. G.; Mc Graw Hill Publishers.
2. Economic Analysis for Highways - Winfrey.R; International TextBook Company.
3. Traffic Engineering and Transport Planning - L.R Kadiyali, Khanna Publishers.
4. Road User Cost Study, CRRI
5. Road Project Appraisal, for Developing Countries, J.W.Dickey ,John Wiley & Sons.

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2MTHE 02 (PAVEMENT CONSTRUCTION MAINTENANCE AND MANAGEMENT)

Course Objectives and outcomes:-

A. to learn about basic PMS.
B. to learn about evaluation of existing pavement
C. to learn about construction and maintenance of pavement

Unit I

Pavement Management System: Components of PMS and their activities; Major steps in implementing PMS; Pavement Maintenance Management Components of Maintenance Management and Related Activities – Network and Project Level Analysis; Prioritization Techniques and Formulation of Maintenance Strategies

Unit II

Pavement Inventories and Evaluation : Serviceability Concepts ;Visual Rating ;Pavement Serviceability Index; Roughness Measurements ;Distress Modes – Cracking Rutting Etc; Pavement Deflection – Different Methods, Skid Resistance, Roughness, Safety – Aspects; Inventory System – Assessment of Deficiencies

Unit III

Pavement Maintenance and Quality Control : Causes of Deterioration, Traffic and Environmental Factors, Methods of Maintaining WBM, Bitumen and Cement Concrete Roads, Quality Assurance; Quality Control – ISO 9000 , Sampling Techniques – Tolerances and Controlsrelated to Profile and Compaction

Unit IV

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

Unit V

Bituminous Pavement Construction and Cement Concrete Pavement Construction: Preparation and Laying of Tack Coat; Bituminous Macadam ,Penetration Macadam, Built up Spray Grout, Open Graded Premix, Mix Seal, Semi-Dense Asphalt Concrete-Interface Treatments and Overlay Construction, IRC Specifications, Introducing Mechanical Mixers, Pavers, Finishers ; Cement Concrete Pavement Analysis - Construction of Cement Roads, Manual and Mechanical Methods, Joints in Concrete and Reinforced Concrete Pavement andOverlay Construction – Related Equipment

References:

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

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2MTHE 03 (TRAFFIC ANALYSIS)

Course Objectives and outcomes:-

A. to learn traffic studies ,their analysis & cost
B. to learn design of signals
C. to learn transportation system management

UNIT-I:

Traffic Flow Description: Types of Statistical distributions; Discrete and continuous distributions; Counting and Interval Distributions used in Traffic Analysis; Poisson's distribution for vehicle arrivals; Headway Distributions – Exponential Distribution; shifted Exponential distribution; ErlangDistribution; composite Distribution.

UNIT-II:

Queueing Theory:M/M/1 & D/D/I System: Introduction to queuing Theory; notation used for describing a queue system; Analysis of M/M/1 system; Assumptions and Derivation of System State Equations; Application of M/M/1 analysis for parking Garages and Toll Plazas- numerical Examples. Queueing Theory - D/D/1 System: Traffic Interruptions like Accidents or Bottlenecks; Analysis of D/D/1 system for delay characteristics; Traffic Signal analysis as D/D/1 system; Computation of delays and queue dissipation Time – Numerical Examples.

UNIT-III:

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

UNIT-IV:

Shockwave Theory: Concept of Shockwave; causes for Traffic Interruptions and Shockwaves; Flow-Density diagram use in Shockwave analysis; Use of Time-space diagram for shockwave description; Bottleneck situations and shockwaves; traffic signal and shockwave theory; numerical Examples for application of shockwave theory;

UNIT-V:

Traffic Simulation: Introduction to Simulation; Need for Simulation Modelling; Steps in Simulation; Interval Oriented and Event Oriented Simulation; Use of Random Numbers in Simulation; Random Number generation methods; Computing headways and arrival times basedon random numbers; Basic concepts of simulation modelling application for Signalised Intersections, Pedestrian Crossings and Transit scheduling.

References:

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

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2MTHE 04 (PAVEMENT MATERIAL CHARACTERIZATION)

Course Objectives and outcomes:-

A. to learn about characteristic of sub grade soil
B. to learn about characteristic of road aggregate
C. to learn about characteristic of uses of road construction

UNIT-I:

Subgrade Soil Characterization: Properties of subgrade layers; different types of soils, Mechanical response of soil; Soil Classification; Index and other basic properties of soil; A criticallook at the different laboratory and in-situ procedures for evaluating the mechanical properties of soils viz. SPT, DCPT, CPT, CBR, Plate Load test & resilient modulus; Suitability of different type of soil for the construction of highway embankments and pavement layers; Field compaction and control. Dynamic properties of soil: FWD test.

UNIT-II:

Introduction To Soil Stabilization : Physical and Chemical modification: Stabilization with admixtures like cement, lime, calcium chloride, fly ash and bitumen. Grouting: Categories of grouting, Art of grouting, Grout materials, Grouting techniques and control. Introduction to Ground improvement techniques; Introduction to Geo textiles and synthetics applications.

UNIT-III:

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

UNIT-IV:

Bitumen And Bituminous Concrete Mix Characterization: Bitumen sources and manufacturing, Chemistry of bitumen, bitumen structure, Rheology of bitumen, Elastic modulus, Dynamic modulus, visco-elastic and fatigue properties, creep test, stiffness modulus of bitumen mixes using shell nomographs; Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties.Modified bitumen: Crumb Rubber Modified bitumen, Natural rubber modified bitumen, polymer modified bitumen; Introduction to emulsified bitumen and its characterization; Long term and short term ageing and its effect on bitumen performance, Tests to simulate ageing of bitumen viz. RTFOT and PAV. Desirable properties of bituminous mixes, Design of bituminous mixes: Modified Marshall's specifications, Introduction to super pave mix design procedure

UNIT-V:

Cement And Cement Concrete Mix Characterization: Types of cements and basic cement properties, Special cements; Quality tests on cement; Tests on cement concrete including compressive strength, flexural strength, modulus of elasticity and fatigue properties; Introductionto advanced concretes like self compacted concrete, Light weight concrete, Roller Compacted Concrete for pavement application; IS method of cement concrete mix design with case studies; Role of different admixtures in cement concrete performance; Joint fillers for Jointed Plain Cement Concrete Pavements and their characterization

References:

1. Atkins, N. Harold, Highway Materials, Soils and Concretes, Fourth Edition, 2002, Prentice-Hall.
2: Kerbs Robert D. and Richard D. Walker, Highway Materials, McGraw-Hill, 1971.
3. Relevant IRC and IS Codes of Practices (Separate List will be given).
4. Read, J. And Whiteoak, D., "*The Shell Bitumen Handbook*", Fifth edition, Shell Bitumen, Thomas Telford Publishing, London 2003
5 Relevant IRC and IS codes

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Elective-II

MTHE205 A (Ground Improvement Techniques)

Course Objectives and outcomes:-

A. to learn the basic principles of various ground improvement techniques
B. to understand the design procedure of various ground improvement techniques
C. to learn use of geo-textile and other synthetic materials for reinforcing soil

Unit-I

Introduction to Ground Modification: Need and objectives of Ground Improvement, Classification of Ground Modification Techniques – suitability and feasibility, Emerging Trends in ground improvement, **vaccum consolidation.**

Unit-II

Mechanical and Hydraulics Modifications: Methods of compaction, Shallow compaction, Deep compaction techniques – Vibro floatation, Blasting, Dynamic consolidation, pre-compression and compaction piles, Field compaction control. Hydraulic Modification - Methods of dewatering – open sumps and ditches, Well-point system, Electro-osmosis, Vacuum dewatering wells; pre-loading without and with sand drains, strip drains and rope drains.

Unit-III

Physical and Chemical modification: Stabilisation with admixtures like cement, lime, calcium chloride, fly ash and bitumen. Grouting: Categories of grouting, Art of grouting, Grout materials, Grouting techniques and control.

Unit-IV

Reinforced Earth Technology and Soil Confinement Systems: Concept of soil reinforcement, Reinforcing materials, Backfill criteria, Art of reinforced earth technology, Design and construction of reinforced earth structures.Soil Confinement Systems - Concept of confinement, Gabbion walls, Crib walls, Sand bags, Evergreen systems and fabric formwork.

Unit-V

Miscellaneous Techniques: Design, Construction and applications of stone columns, lime columns and Cofferdams.

References:

1. Manfred R. Hansmann - Engineering principles of ground modification - Mc. Graw-Hill pub. Co., New York.
2. Robert M. Koerner - Construction and Geotechnical methods in Foundation Engineering – Mc.Graw-Hill Pub. Co., New York.
3. Winterkorn and Fang - Foundation Engineering Hand Book – Van Nostrand Reinhold Co., New York.
4. Aris C. Stamatopoulos & Panaghiotis C. Kotzios – Soil Improvement by Preloading – John Wiley & Sons Inc. Canada.
5. P. Purushothama Rao – Ground Improvement Techniques – Laxmi Publications (P) Limited.

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MTHE205B (Advanced Modelling Techniques In Highway Engineering)

Course Objectives and outcomes:-

To impart knowledge of various smart solutions and advanced modelling techniques used in Highway engineering, and also to enrich new innovative ideas in them

Unit-I

Introduction to Artificial Intelligence (AI), Significance of AI in Transportation Engineering and uses of AI for solution of Transportation Engineering problems. Comparison between statistical methods and various AI techniques.

Unit-II

Fuzzy-logic: Introduction to Fuzzy-logic, merits and limitations of Fuzzy-logic, crisp sets: types and properties of crisp sets, Partition and covering, Fuzzy sets: membership function, basic fuzzy set operations, Fuzzy Relations, Fuzzy Logic applications in TransportationEngineering.

Unit-III

Artificial Neural Networks (ANN): Introduction to Artificial Neural Networks (ANN), merits and limitations of ANN, Model of an Artificial Neuron, Neural Network Architectures: Single layer, Multi-layer feed-forward and Recurrent Networks, Learning methods (in Brief), Back- propagation Technique: Single and multi layer feed-forward Neural Network, Back propagation learning, Computations of Input, hidden and output layers, Calculation of error, Training of Neural Network, method of steepest descent and applications of Back-propagationLearning Algorithm in Transportation Engineering.

Unit-IV

Genetic Algorithms (GA): Basic concepts of Genetic Algorithms (GA), Working Principle, types of Encoding, cross-over, Fitness function, Methods of Reproduction (in brief) and Applications of GA in Transportation Engineering, **advanced modelling techniques.**

Unit-V

Expert Systems (ES): Introduction to Expert Systems (ES), basic concepts of ES and their Applications in Transportation Engineering.

Text Books:

1. Neural Networks, Fuzzy Logic and genetic Algorithms, Synthesis and Applications, by S.
2. Rajasekaran and G. A. Vijayalakshmi Pai, Prentice hall of India Pvt. Ltd. New Delhi, 2003.
3. Fuzzy Logic With Engineering Applications, Timothy J. Ross, Mcgraw-Hill, 1995.

References :

1. Artificial Intelligence in Business-Expert System, Harmon P and D. King, John Willey & Sons
2. Relevant IRC and TRB publications.

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MTHE205C (Financial Management in Construction Industries)

Course Objectives and outcomes:-.:

To impart knowledge of activities that accurately forecast project cost, timelines and quality improvementprocess for successful resources, communication and risk and change management

Unit-I

Personnel Management :- Principle of personnel management. Qualities of a personnel manager. Objective of personnel Management Personnel policied procedures and programmes. Organizational structure of personnel department. Man power re resource. Human planning. Job analysis. Performance standards, work rules. Recruitment and selection process. Tests and interview Induction orientation and in doctrination. Policies, promotion, demotion, transfers etc. Training of personnels. Need for training . Principles of training programmes. Types of training programmes on the job training policy and implementation. Task analysis identification and methodologies. Evaluation of training and post training follow up. Performance appraisal-rating scales, rankings etc. Management development programmes. Wage and salary management. Principles of wages and salary administration. Factors in influencing wages. Types of wages and salary structure. Theory of wages. Minimum fair and living wages. Types of wages. Wage incentive. Types of incentive schemes. Profit sharing features-Fringe benefits general scope. Different types of fringe benefits and awards

Unit-II

Labour Management :- Industrial relations in construction industry. Principles of industrial relationships. Functional requirements and programme, Industrial disputes, causes of disputes. Types Of disputes. Procedures of the settlement of industrial disputes. Implementation mechanism.Trade Unions - Principles of industrial trade unionism. Objectives and functions. Essentials of trade union. Objectives, forms levels and growth of worker's participation in management. Collective bargaining. Principles and main features of collective bargaining. Different industrial Regulations and labour laws and acts – Industrial Health and Safety. Occupational hazards. Provisions under factory act. Accident and safety at construction sites. nature and causes of accident. Safety Programmes and their principles. Factors effectingaccidents etc.

Unit-III

Waste Management :- Introduction to waste and waste management, the concept of productivity and its inter relationship with productivity. Systems concept of waste. Complementarity of waste and resourcemanagemen construction waste material waste, man power waste, energy waste, space waste time waste, equipment waste, capi and services waste. Data and information waste.Design of waste reduction in construction. Reduction, Collection, re and disposal of waste in construction systems. Modelling of resources and waste flow in construction systems waste cost reduction. Roles of legislation and government.

Unit-IV

Financial Management :- Managerial Economics & Financial Statement Nature and scope of managerial economics. Economic theories. Demand analysis and fore casting . Elasticities of demand. Cost and production analysis. Pricing decisions, Policies and practices. Break even analysis. Time value of money, Economics. Comparisons using time value of money basic of comparisons. Decision making amongst alternatives. Cash flow, discounted cash flow. Cash flow forecasting, Project appraisal through financial statements. Statement analysis. Financial ratio analysis, Trend analysis yield. Taxation and inflation, Sinking fund provisions. Risks and uncertainties. Project risk and firm risk. Replacement analysis. Finances & working capital.

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Capital budgeting & Performance budgeting.
Benefit- cost ratio. Project selection, Control and evaluation, Pre-project and post project evaluation.

Unit-V

Capital Generation & Financial Accounting Banking : Financial Institutes like IFCI, IBI, International financing etc.Book keeping process in construction. The acciybtabcy cycle. Journals, ledgers etc. for labour cost, materials and purchases miscellaneous ledgers and accounting procedures, types of financial statements

MTHE 206-P (Highway Engineering Lab – II)

Course Objectives and outcomes:-

To impart knowledge in traffic flow characteristics, flow modeling & computer simulation. Student would have gained knowledge on traffic flow that would help them to develop an efficient transport system.and the student would have gained knowledge of highway design & traffic analysis

1. Traffic Surveys:
i. Traffic Volume Studies
ii. Spot Speed Studies
iii. Floating Car Technique
iv. Headway and Gap-Acceptance Studies
v. Delay Studies
vi. Pedestrian Survey
2. Parking Surveys:
i. On-Street Parking Studies
ii. Off-Street Parking Studies
3. Highway Capacity Estimation
4. MX – Roads
5. Road Safety Auditing

References:

1. Principles and Practice of Highway Engineering, L.R.Kadiyali and N.B.Lal, Khanna, 2007.
2. Traffic Engineering and Transportation Planning, L.R.Kadiyali, Khanna Publications, 2007.

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SEMESTER III

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3MTHE01 (CONCRETE TECHNOLOGY)

Course Objectives and outcomes:-

A. to understand the properties of ingredients

B. to study the behavior of concrete at its fresh & hardened state

C. to understand special concrete &their uses

UNIT-I

Cement and Admixtures: Portland cement - chemical composition – Bogues compounds - hydration - structure of hydrated cement - mechanical strength of cement gel - water held in hydrated cement paste - heat of hydration of cement - influence of compound composition on properties of cement - different types of cements. Admixtures - Classification – Mineral and chemical admixtures - Classification of mineral admixtures – properties – dosage - uses – Chemical admixtures – classification – properties – uses – High range water reducing agents –effect of dosage – multiple dosage of admixtures and their effects – effects of admixtures in RMC,bacterial concrete, self-healing concrete,**(FBC) fly ash and its performance in concrete, Nanotube in Admixtures.**

UNIT-II

Aggregates: Classifications of aggregates - particle shape and texture - bond, strength and other mechanical properties of aggregate - specific gravity, bulk density, porosity, absorption and moisture content of aggregate - bulking of sand - deleterious substance in aggregate - soundness of aggregate - alkali-aggregate reaction - thermal properties - sieve analysis - fineness modulus - grading curves - grading of fine and coarse aggregates - gap graded aggregate - maximum aggregate size – combined a grading – BIS grading.

UNIT-III

Fresh Concrete and Hardened Concrete: workability - factors affecting workability - measurement of workability by different tests - effect of time and temperature on workability - segregation and bleeding - Mixing of concrete - different types of mixing – vibration of concrete – revibration – setting times of fresh concrete – steps in manufacture of concrete – quality of mixing water. Hardened Concrete - water/cement ratio - Abram's law – Gel space ratio Maturity concept- effective water in mix - nature of strength of concrete - strength in tension and compression -Griffith's hypothesis - autogenous healing - curing of concrete - influence of temperature on strength - steam curing - testing of hardened concrete – relation between compressive and tensile strength - factors affecting strength - non-destructive testing methods. Durability of concrete - codal provisions.

UNIT-IV

Elasticity, Shrinkage and Creep: Modulus of elasticity – static and dynamic modulus of elasticity - Poisson's ratio - early volume changes - swelling - shrinkage - mechanism of shrinkage - factors affecting shrinkage - differential shrinkage - moisture movement - creep of concrete - factors influencing creep - relation between creep and time - nature of creep - effectsof creep in structural concrete – Codal provisions – Rheology of creep.

UNIT-V

Concrete Mix Design and Special Concrete Issues: factors in the choice of concrete mix proportions – statistical quality control – Acceptance criteria as per IS 456-2000 – various mix design methods for normal concrete – BIS method – Road note no.4 method, ACI method – High strength concrete mix design – durability aspects in concrete mix design as per IS 456-2000.Special Concrete - Light weight concrete – Light weight aggregates – Light weight concrete mix design – Cellular concrete – Fiber reinforced concrete – Different types of fibres – Factors affecting properties of F.R.C. – Applications – Polymer concrete – Types of polymer concrete – Properties of polymer concrete – Applications – High Performance Concrete -Self Compacting concrete – smart concrete, **GGBS Slag Based Concrete, Micro structure properties of Concrete.**

TEXT BOOKS:

1. Properties of Concrete by A.M.Neville, ELBS publications.
2. Concrete Technology by M.S.Shetty, S.Chand & Co.

REFERENCES:

1. Special Structural concretes by Rajat Siddique, Galgotia Publications.
2. Design of Concrete Mixes by N.Krishna Raju, CBS Publications.Concrete: Micro Structure by

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P.K.Mehta, ICI, Chennai

3MTHE 02 (Communication and Research Methodology)

Course Objectives and outcomes:-

Provide or overview the concept methods and tools by which communication research is designed ,conducted inpreced and critically evaluated .

Unit 1

Concepts of Communications: Definition, Forms of Communication, Objectives of Communication, Characteristics of Communication, Process of Communication, Communication, Roadblocks, Role of Verbaland Non-verbal Symbols in Communication, Barriers to Effective Communication, Overcoming Communication Barriers.
Nonverbal communication: Body Language, Gestures, Postures, Facial Expressions, Dress codes; the Cross Cultural Dimensions of Business Communication; Listening and Speaking, techniques of electing response, probing questions, Observation. Business and social etiquettes;
Listening Skills: Definition, Anatomy of poor Listening, Features of a good Listener, Role Play, Group Discussion and Interviews, Meetings: Ways and Means of conducting meetings effectively, Mock Meetings and Interviews

Unit 2

Reading and language skills: The reading process, purpose, different kinds of texts, reference material, scientific and technical texts, active and passive reading, strategies - vocabulary skills, eye reading and visual perception, prediction techniques, scanning skills, distinguishing facts and opinions, drawing inferences and conclusions, comprehension of technical material - scientific and technical texts, instructions and technical manuals, graphic information.
Forms of Communication in Written mode: Basics Body language of Business Letters and Memos, Tone of writing, Enquiries, orders and replying to them, sales letters, Job applications and resume, E-mail: How to make smart e-mail, Writing Business Reports and Proposals, Practice for Writing.

Unit 3

Referencing and Writing skills: Business letters: Enquiries, Circulars, Quotations, Orders, Acknowledgments, Executions, Complaints, Claims and adjustments, Collection letter, Banking correspondence, Agency correspondence, Bad news and persuading letters, Sales letters, Job application letters - Biodata, Covering Letter, Interview Letters, Letter of Reference, Memos, minutes, Circulars & notices.
Types of Business Reports - Format, Choice of vocabulary, coherence and cohesion, paragraph writing, organization reports by individual, Report by committee.

Unit 4

Introduction to Research and Research Design: Nature and scope of research, information based decision making and source of knowledge. The research process; basic approaches and terminologies used in research. Defining research question and framing of hypotheses, preparing a research plan, qualitative and quantitative research designs, Experimentation, Observational studies, Exploring secondary data.
Measurement and Scaling, Data Source and Data Collection Field research: primary data collection from observations, surveys and experimentation. Measurement and scaling; commonly used scales in reliability and validity of scales. Designing instrument for data collection; testing the instrument, data collection process, Sampling methods and procedures and sample size decisions.

Unit 5

Data Analysis and Presentation Editing and coding of data, tabulation, graphic presentation of data, cross tabulation, Testing of hypotheses; type I and II errors, one tailed and two tailed tests of significance, Parametric and nonparametric tests for Univariate and Bivariate data. Tests of association; simple linear regression and other non parametric tests.

Technical Writing: Technical Proposal writing: Definition, Purpose, types, characteristics, Elements of structure, style and appearance, evaluation, exercises, Research report writing, Proposal writing, referencing, forms of reports, bibliography, etc. Research paper, Dissertation, and Thesis, Instruction Manuals, Type of instructions, Writing

Instructions, Technical Descriptions, Process descriptions, Guidelines for Writing GoodDescriptions.

Text Books:

1. Lesikar, R. V. & Flatley, Basic Business Communication Skills for Empowering the Internet Generation. TMH.
2. Meenakshi Raman, Sangeeta Sharma, Technical Communications, Oxford Latest Edition.
3. D. K. Bhattacharyya, Research Methodology, Excel Books 2nd Edition.

References:

1. Bowman, J.P. & Branchaw, P.P. Business Communications, Process to Product Dryden Press, Chicago.
2. M Ashraf Rizvi, Effective Technical Communication, Tata McGraw Hill.
3. E. H. McGrath, Basic Managerial Skills, Prentice hall India
4. Sajitha, Technical Writing, Himalaya Latest Edition

Elective III

MTHE303A (Construction Equipment & Material Management)

Course Objectives and outcomes:-

To train the students with the latest and the best in the rapidly changing fields of construction engineering
To prepare the students to be industry leaders who implement the best engineering and managementpractices and technologies in the construction industries

Unit-I

Planning and Selection of Construction Equipment: - Advantage of mechanization of Construction in Labour intensive construction. Planning for construction equipments. Analytical studies, equipment operation. Construction machinery & equipments.

Unit-II

Production Estimates, Sizing and Matching :- Cycle time capacity ratings and output of Excavators, Po drag lines, scrapper, bulldozers, tractor shovels rippers, motor graders etc. Sizing and matching. Capacity rating compactors, aggregate processing plant concrete production plants etc. material management systems, **Goals of Materials Management**, **Role of Materials Handling.**

Unit-III

Economics of Construction Equipment: - Equipment working rates, Investment cost, Depreciation cost, Cost of fuel and lubricants. Cost of labour, servicing and field repairs, overheads. Recommendations of statuator, **Information Technology for construction Equipment, AI in Construction Equipment, Life Cycle cost Analysis.**

Unit-IV

System Approach: - Problems of equipment management. Application of CPM in equipment manage of the assignment model, transportation model and waiting line models in equipment management

Unit-V

Material Management: - Materials planning and budgeting. Role and functions at different levels of management and budgeting variations. Stages of materials management. A.B.C. analysis. Advantages, me cautions, limitations and tabular analysis. Purchasing parameters and inter relationships. Time source quanti grading systems. Special purchasing systems. Obsolescence. Scrap disposal.

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3MTHE03 B (ENVIRONMENTAL IMPACT ASSESSMENT FOR TRANSPORTATION PROJECTS)

Course Objectives and outcomes:-

To impart knowledge regarding the Environment Impact Assessment requirements and procedures for any transportation project

UNIT-I:

Introduction: Environment and its interaction with human activities - Environmental imbalances - Attributes, Impacts, Indicators and Measurements - Concept of Environmental Impact Assessment (EIA), Environmental Impact Statement, Objectives of EIA, Advantages and Limitations of EIA

UNIT-II:

Environmental Indicators - Indicators for climate - Indicators for terrestrial subsystems - Indicators for aquatic subsystems - Selection of indicators - Socio-economic indicators - Basic information - Indicators for economy - Social indicators - Indicators for health and nutrition - Cultural indicators - Selection of indicators.

UNIT-III:

Environmental Impact Assessment For Transportation Projects: Basic Concepts, Objectives, Transportation Related Environmental Impacts – Vehicular Impacts – Safety & Capacity Impacts– Roadway Impacts – Construction Impacts, Environmental Impact Assessment – Environmental Impact Statement, Environment Audit, Typical case studies

UNIT-IV:

Environmental Issues in Industrial Development: On-site and Off-site impacts during various stages of industrial development, Long term climatic changes, Green house effect, Industrial effluents and their impact on natural cycle, Environmental impact of Highways, Mining and Energydevelopment

UNIT-V:

Methodologies for Carrying Environmental Impact Assessment: Overview of Methodologies Adhoc, Checklist, Matrix, Network, Overlays, Benefit Cost Analysis, Choosing A Methodology,Review Criteria.

References:

1. Jain, R.K., Urban, L.V., Stracy, G.S., (1991), "Environmental Impact Analysis", Van Nostrand Reinhold Co., New York
2. Rau, J.G. and Wooten, D.C., (1996), "Environmental Impact Assessment", McGraw Hill Pub. Co., New York
3. UNESCO, (1987), "Methodological Guidelines for the Integrated Environmental Evaluation of Water Resources Development", UNESCO/UNEP, Paris
4. Canter, L.W., (1997), "Environmental Impact Assessment", McGraw Hill Pub. Co., New York

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MTHE303 C (LAND USE AND TRANSPORTATION MODELLING)

Course Objectives and outcomes:-

To impart the knowledge of various landuses and the type of transportation models required for it for a well planned and sustainable development in various areas.

UNIT-I

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

UNIT-II

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

UNIT-III

General Travel Demand Models: Aggregate, Disaggregate models ; Behavioral models; Recursive and direct demand Models; Linear, Non-Linear models; Logit, discriminant and probit models; Mode split models - Abstract mode and mode specific models.

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UNIT-IV

Regional Transport Models: Factors affecting goods and passenger traffic; Prediction of traffic; Growth factor models; Time function iteration models; Interna1 volume forecasting models.

UNIT-V

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

References:

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

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MTHE304 (Preliminary Work on Dissertation)

Objectives:

a) To make familiar with course object and acquire knowledge
b) Application of knowledge in solving real problems.
c) Learn to integrate the ideas, data and avoidance from return and oral sources into writing projects

Outcomes:

a) Capable to conduct research in writing studies and profession writing.
b) Capable to improve their ability to frame and analysis problems
c) Impart advanced skills in planning, drafting and editing.

The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format. The student will have to present the progress of the work through seminars and progress reports.

MTHE305 (Seminar based on Dissertation)

Objectives:

a) To make familiar with course object and acquire knowledge
b) Application of knowledge in solving real problems.
c) Learn to integrate the ideas, data and avoidance from return and oral sources into writing projects

Outcomes:

a) Capable to conduct research in writing studies and profession writing.
b) Capable to improve their ability to frame and analysis problems
c) Impart advanced skills in planning, drafting and editing.

The student will deliver a seminar on the topic chosen by him and approved by Departmental committee for evaluation at the end of semester

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SEMESTER IV

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4MTHE01 (Dissertation)

Objectives:

a) To make familiar with course object and acquire knowledge
b) Application of knowledge in solving real problems.
c) Learn to integrate the ideas, data and avoidance from return and oral sources into writing projects

Outcomes:

a) Capable to conduct research in writing studies and profession writing.
b) Capable to improve their ability to frame and analysis problems
c) Impart advanced skills in planning, drafting and editing.

The student will submit a detailed Project Report on the topic approved by Departmental committee in a specified format and will also deliver a Presentation on the topic chosen at the end of semester.