

MBM 204 RESEARCH METHODOLOGY**3L-0T-0P-3C****MM 100****Module 1**

Research: a) Types, Research process and steps in it, Hypothesis, Research proposals and aspects. b) Research Design: Need, Problem Definition, variables, research design concepts, Literature survey and review, Research design process, Errors in research. c) Research Modeling: Types of Models, Model building and stages, Data consideration and testing, Heuristic and Simulation modeling.

Module 2

Report Writing: Pre writing considerations, Thesis writing, Formats of report writing, formats of publications in Research journals.

Module 3

Design of Experiments: a) Objectives, strategies, Factorial experimental design, Designing engineering experiments, basic principles-replication, randomization, blocking, Guidelines for design of experiments b) Single Factor Experiment: Hypothesis testing, Analysis of Variance components (ANOVA) for fixed effect model; Total, treatment and error of squares, Degrees of freedom, Confidence interval; ANOVA for random effects model, Estimation of variance components, Model adequacy checking. c) Two factor Factorial Design, Basic definitions and principles, main effect and interaction, response surface and contour plots, General arrangement for a two-factor factorial design; Models-Effects, means and regression, Hypothesis testing.

Module 4

Spreadsheet Tool: Introduction to spreadsheet application, features and functions, Using formulas and functions, Data storing, Features for Statistical data analysis, Generating charts/ graph and other features. Tools used may be Microsoft Excel, Open office or similar tool.

Module 5

Presentation Tool: Introduction to presentation tool, features and functions, Creating presentation, Customizing presentation, Showing presentation. Tools used may be Microsoft Power Point, Open Office or similar tool.

Web Search: Introduction to Internet, Use of Internet and WWW, Using search engine like Google, Yahoo etc, Using advanced search techniques.

Text/Reference Books:

1. Montgomery, Douglas C. (2007), 5/e, Design and Analysis of Experiments, (Wiley India)
2. Montgomery, Douglas C. & Runger, George C. (2007), 3/e, Applied Statistics & Probability for Engineers (Wiley India)
3. Kothari C.K. (2004), 2/e, Research Methodology- Methods and Techniques (New Age International, New Delhi)
4. Krishnaswamy, K.N., Sivakumar, Appa Iyer and Mathiranjani M. (2006), Management Research Methodology; Integration of Principles, Methods and Techniques (Pearson Education, New Delhi)
5. The complete reference Office Xp, Stephan L. Nelson, Gajuliah Kelly (TMH)

MGT 103 : PROJECT FORMULATION & APPRAISAL TECHNIQUES

3L+0T+0P+ 3C

MM 100

- Module 1** Introduction – project attributes; project life cycle; role of managers; Management – scheduling; Gantt charts; CPM; PERT; crashing; Generation of project ideas – resource allocation; environment analysis – PEST analysis, porter’s model; analysis of strategic capabilities – value chain, BCG matrix, flexibility
- Module 2** Appraisal methods in project scanning and selection – market appraisal; technical appraisal; environmental appraisal; evaluating intangibles, social appraisal – SCBA, UNIDO, LM, CSR.
- Module 3** Total quality management: Introduction - Need for quality - Evolution of quality - Definition of quality -Basic concepts of TQM - Definition of TQM – TQM Framework -Contributions of Deming,TQM principles, The seven traditional tools of quality – New management tools – Six-sigma.
- Module 4** **Financial Appraisal:** Time value of money; cost of capital – equity, debt, preference; weighted average cost; marginal and average cost; Capital budgeting – investment appraisal techniques; NPV; IRR; Payback period; replacement decisions; selection of exact discount factor – problems, inflation, taxation;
- Module 5:** **Risk Analysis** models – single probability analysis; sensitivity analysis; break even analysis; certainty equivalent; uncertainty analysis, simulation; decision tree model; risk and utility.

Recommended Books

1. KhatuaSitangshu. *Project Management and Appraisal*, Oxford University Press
2. Pandey, I.M. *Financial Management*. Vikas Publishing House
3. Prasanna, Chandra. *Financial Management*. Tata McGraw-Hill
4. Maheshwari, S .N. &Maheshwari, S. K. *Advanced Management Accounting Vol.1 & Vol.2*. Vikas Publishing House
5. Paresh Shah. *Management Accounting*. Oxford University Press

MTE 103 PAVEMENT MATERIALS AND CHARACTERISATION**3L+1T+0P+4C****MM: 100****Module 1**

Introduction: Materials used for construction of subgrade, materials for low cost roads, stabilized soil, lime, fly ash, and cement and soil bitumen stabilization. Aggregate base course, bituminous base and surface courses of pavement

Module 2

Understanding different tests: CBR, Durability, Freeze Thaw, Resilience Modulus, Soil Suction, relationship between DCP and CBR and other parameters.

Module 3

Characterization of aggregates for application in the pavement. Different types of rocks and aggregate production and process, Straight-run bitumen, emulsions, cutback and modified binders, penetration and viscosity grading system for bitumen. Modification of bitumen using polymer and crumb rubber. Visco-elastic modeling (creep, mechanical models).

Module 4

Introduction to super pave grading system. Understanding mixing and compaction temperature of bitumen. Introduction to different type of mixes, Hot mix asphalt, cold mix asphalt.

Module 5

Understanding volumetric calculation, design of emulsified mixes. Marshall and superpave mix design of different type of mixes. Application of waste and locally materials for construction of pavements, quality control and assurance practices.

Note: Design of mixes by super pave Technology: Self study course.

Text/Reference Books:

1. F. L. Roberts, P. S. Khandal, E. R. Brown, D. Y. Lee and T. W. Kennedy. Hot mix asphalt materials, mixture design and construction, National Asphalt Pavement Association Research and Education Foundation, 2nd Ed. USA, 1996
2. Y. H. Huang. Pavement analysis and design, 2nd Ed., Pearson Prentice Hall, USA, 2004
3. Asphalt Institute, SP-1: Performance grading of asphalt binder – specifications and testing.
4. MORT&H – specifications for roads and bridges, 5th Rev., 2013
5. IRC: 44-1976 work pertains to concrete pavement.

MTE 104 URBAN TRANSPORT AND PLANNING**3L+0T+0P+3C****MM: 100****Module 1**

Introduction and scope: Definition and basic principles, Transportation problems, Types of models, Planning and methodologies, Conventional transportation planning process.

Module 2

Travel demand modeling and forecasting, Trip generation – regression, category analysis, Trip distribution-growth factor, Fratar and Furness Methods.

Module 3

Calibration of gravity models, intervening opportunities model, competing opportunities model, LP model, Modal split models – aggregate and disaggregate models, discriminant, logit and profit analysis.

Module 4

Traffic Assignment – route building, capacity restraint, multipath, incremental and equilibrium assignment, Graph theory applications in transport network analysis, urban goods movement.

Module 5

Land use-transport models: historical development, case studies, ISGLUTI Study, recent developments.

Text/Reference Books:

1. Hutchinson, B. G. Principles of Urban Transport Systems Planning, McGraw Hill, New York, 1974
2. Ortuzar, J. and Willumten, L.G. Modelling Transport, Wiley, Chichester, 1994
3. Oppenheim, N. Urban Travel Demand Modelling: From individual choices to general equilibrium, Wiley, New York, 1995
4. Thomas R. Traffic Assignment Techniques, Avebury Technical, Aldershot, 1991
5. Taniguchi, E. Thompson R.G., Yamada T. and Van Duin R. City logistics – Network modeling and intelligent transport systems, Elsevier, Pergamon, Oxford, 2001.
6. Bruton M. J. introduction to transportation planning
7. Hutchinson, Dickey J. W. Metropolitan transportation planning, Tata McGraw Hill, New Delhi, 1975.

MTE 105: SEMINAR-I

0L+0T+8P+4C

MM: 100

Students will be grouped in two to three; will have to decide final research area of thesis, download research papers from ASME, Elsevier, Springer etc. This activity may also require visiting Learning Resources Centre of other institute of national importance.

Summarizing paper: Reading abstracts and finding ideas, conclusion, highlight of their approach, the drawbacks of the papers. Generalize results from a research paper to related research problems.

Comparing the approach -identify weaknesses and strengths in recent research articles in the subject. Practice sessions on how to read, analyze and summarize research papers. Students in group will have to deliver presentation, prepare a report and a review paper based on analysis.

Internal continuous assessment marks are awarded based on the relevance of the topic, presentation skill, quality of the report and participation.

MTE 106: ADVANCED MATERIAL TESTING LAB & CASE STUDIES

0L+0T+4P+2C

MM: 100

1. Specific gravity and water absorption test of aggregate.
2. To determine fineness modulus of a given sample of coarse aggregate.
3. To determine the elongation index for given sample of aggregate.
4. To determine the flakiness index of given sample of aggregate.
5. Aggregate impact test
6. Los angles abrasion test
7. Aggregate crushing value test.
8. Standard penetration test for Bitumen.
9. Standard tar viscometer test
10. Ductility test
11. To determine the softening point for give sample of bitumen.
12. Marshall Stability test.

MTE 201 HIGHWAY CONSTRUCTION**3L+1T+0P+4C****MM: 100****Module 1**

Embankment Construction: Formation cutting in soil and hard rock, preparation of sub grade, ground improvement, Retaining and breast walls on hill roads, granular and stabilized, sub bases/bases, water bound macadam (WBM), Wet Mix Macadam(WMM), Cement treated bases, Dry Lean Concrete (DLC).

Module 2

Bituminous Construction: Types of bituminous constructions interface treatment, bituminous surfacing and wearing courses for roads and bridge deck slabs, selection of wearing course under different Climatic and Traffic conditions, IRC specifications, Construction techniques and quality control.

Module 3

Concrete Road Construction: Test on concrete mixes, construction equipments, Method of construction of joints in concrete pavements. Quality Control in Concrete pavements. Recycled pavements , Non-Conventional Pavements, Overlay Construction.

Module 4

Prime Coat, Tack Coat & Seal Coat, BM, 20mm PMC, DBM, BC, S.D., MSS, Mastic Asphalt Sections 900 of MORTH, Q/C Norm for all Layers.

Module 5

Hill Roads Construction: Stability of Slopes, Landslides-Causes and Control measures, Hill road Drainage, Construction and maintenance problems and remedial measures.

Text/Reference Books:

1. Highway Engineering- S.C. Rangwala, revised by K.S. Rangwala & P.S. Rangwala
2. S P CHANDOLA, "A Text Book of Transportation Engineering" S Chand & Company Ltd.,
3. G V RAO, "Principles of Transportation & Highway Engineering" Tata McGraw-Hill Publishing Company Ltd.,
4. Madhan Mohan Dass, " Structural Analysis" PHI Learning Pvt. Ltd., New Delhi.

MTE 202 PAVEMENT ANALYSIS & DESIGN**3L+1T+0P+4C****MM: 100****Module 1**

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, truck factor , growth factor, lane distribution and vehicle damage factors, effect of transient and moving loads.

Module 2

Stresses In Flexible And Rigid Pavements: Stress including 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; westergaard's theory and assumptions , stresses due to curling, stresses and deflections due to loading, frictional stresses, stresses in dowel bars and tie bars.

Module 3

Design of Flexible Pavements: Development of design methods, flexible pavement design concepts and asphalt institutes methods with HMA and other based combinations, AASTHO, IRC methods for highways and low volume roads

Module 4

Design of rigid pavements: calibrated mechanistic design process, PCA, AASTHO and IRC specifications, rigid pavement designs for low volume rural roads and highways. Design of overlays: types and design of overlays, Irc methods of overlays designs, importance of profile correction course.

Module 5**IRC-37, IRC-58.****Text/Reference Books:**

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

MTE 205 PAVEMENT MAINTENANCE & MANAGEMENT SYSTEM

3L+1T+0P+4C

MM: 100

Module 1

Pavement management system: Components of PMS and their activities; Major steps in implementing PMS; Inputs; Design, Construction and Maintenance; Rehabilitation and Feedback systems; Examples of HDM and RTIM packages; Highway financing; Fund generation; Evaluating alternate strategies and Decision criteria ; Pavement Maintenance Management Components of Maintenance Management and Related Activities – Network and Project Level Analysis; Prioritization Techniques and Formulation of Maintenance Strategies.

Module 2

Pavement Inventories, Quality Control and Evaluation: Serviceability Concepts ;Visual Rating ;Pavement Serviceability Index; Roughness Measurements ;Distress Modes – Cracking Rutting Etc; Pavement Deflection – Different Methods and BBD, Skid Resistance, Roughness, Safety – Aspects; Inventory System. Causes of Deterioration, Traffic and Environmental Factors, Pavement Performance Modeling Approaches and Methods of Maintaining WBM, Bitumen and Cement Concrete Roads, Quality Assurance; Quality Control – ISO 9000, Sampling Techniques –Tolerances and Controls related to Profile and Compaction.

Module 3

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, Shoulder Construction; Drainage Surface, Turfing Sand Drains; Sand Wicks; Rope Drains, Geo- Textile Drainage; Preloading Techniques.

Module 4

Bituminous Construction and Maintenance: 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.

Module 5

Cement Concrete pavement Construction and Maintenance: Cement Concrete Pavement Analysis - Construction of Cement Roads, Manual and Mechanical Methods, Joints in Concrete and Reinforced Concrete Pavement and Overlay Construction.

Text/Reference Books:

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.
6. MORTH - Specifications.

MTE 206 INTERSECTION DESIGN (SP-41) & ANALYSIS**3L+1T+0P+4C****MM: 100****Module 1**

Type of intersection, general considerations for the location of various intersection types, principles of intersection design, types of maneuvers, relative speed, conflict points and areas, design surveys for intersection, intersection geometrics for various types including approach and exit details.

Module 2

Capacity and performance: analysis of various types of intersections for various types of operation-capacity level of service, intersection delay, uncontrolled priority controlled and roundabout intersection-their capacity and delay analysis, and overall design.

Module 3

Design and operational evaluation of weaving sections. Design of speed change lanes and median lanes.

Module 4

Grade separated intersection and interchanges-types, suitability and economic justifications.

Module 5

Design of intersection controls-signalization design and analysis, turn control, general traffic control by islands, pedestrian control, signs, markings, intersections lighting etc.

Text/Reference Books:

1. Transport Research Board, "Highway Capacity Manual," SR- 209,TRB,1985,1994,
2. Institution of Transportation Engineers, "Transportation and Traffic Engineering Hand Book"
1. ITE Prentice Hall, New Jersey, 1976
2. Mc Shane, W.R. and Roes R.P., "Traffic Engineering." Prentice Hall New Jersey
3. Khistry C.J., "Transportation Engineering, An Introduction," Prentice Hall, New Jersey
4. Mc Shane, W.R.e. Roes, R.P "Traffic Engineering (Prentices Hall, New Jersey, 1990)
5. Institute of Transportation Engineers "Transport & Traffic Engineering Hand Book" (ITE, Prentice Hall new Jersey 1976)
6. Prentice Hall new Jersey 1976)
7. Hanburger W.S. & Kell J.H. "Fundamentals of Traffic Engineering (ITS California, 1984)
8. Transportation Research Board, "Highway Capacity Manual (SR- 209 TRB, 1985,1994)

MTE 207 GROUND IMPROVEMENT TECHNIQUES

3L+1T+0P+4C

MM: 100

Module 1

Introduction to Ground Modification: Need and Objectives of Ground Improvement, Classification of Ground Modification Techniques-Suitability and Feasibility, emerging trends in Ground Improvements.

Module 2

Mechanical Modification: Methods of Compaction, Shallow Compaction, Deep Compaction Techniques-Vibro Floatation, Blasting, Dynamic Consolidation, Pre-Compression and Compaction Piles, Field Compaction Control.

Module 3

Hydraulic Modification: Methods of Dewatering-Open Sumps and ditches, WellPoint System, Electro-Osmosis, Vacuum Dewatering Wells: pre -loading without and with Sand Drains, Strip Drains and Rope Drains.

Physical and Chemical Modification: Stabilization with admixtures like cement, lime, calcium chloride, fly ash and bitumen.

Module 4

Grouting: Categories of Grouting, Art of Grouting, Grout Materials, Grouting Techniques and control.

Reinforced Earth Technology: Concept of Soil Reinforcement, Reinforcing Materials, Backfill Criteria, Art of reinforced earth technology, design and construction of reinforced earth structures. Use of geo-synthetics, Textiles & Jute etc.

Module 5

Soil Confinement Systems: Concept of confinement, Gabion Walls, Crib Walls, Sand bags, Evergreen systems and Fabric formwork.

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

Text/Reference Books:

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

MTE 208 GIS AND ITS APPLICATIONS**3L+1T+0P+4C****MM: 100****Module 1**

Photogrammetry: Definition of Photogrammetric Terms, Geometry of aerial and terrestrial photographs, Aerial camera and photo-theodolite, Scale of a Photograph, Tilt and Height displacements, Stereoscopic vision and stereoscopes, Height determination from parallax measurements, Flight planning, Maps and Map substitutes and their uses.

Module 2

Remote Sensing: Introduction and definition of remote sensing terms, Remote Sensing System, Electromagnetic radiation and spectrum, Spectral signature, Atmospheric windows.

Module 3

Different types of platforms, sensors and their characteristics, Orbital parameters of a satellite, Multi concept in Remote Sensing.

Module 4

Image Interpretation: Principles of interpretation of aerial and satellite images, equipments and aids required for interpretation, ground truth – collection and verification, advantages of ultimate and multiband images. Digital Image Processing concept.

Module 5

Geographic Information System (GIS) : Introduction & applications of GIS in map revision, Land use, Agriculture, Forestry, Archaeology, Municipal, Geology, water resources, Soil Erosion, Land suitability analysis, change detection.

Text/Reference Books:

1. Basics of Remote Sensing & GIS by Dr. S.Kumar , Univertsity Sc. Press.
2. Geographic Information System by Kang Tsung Chang, Tata Mc Graw Hills.
3. Remote Sensing and GIS by Legg.C.A., Ellis Horwood, London.
4. Remote sensing and GIS by Bhatt Oxford University Press.

MTE 209 ROAD SAFETY AUDIT

3L+1T+0P+4C

MM: 100

Module 1

Introduction: Road traffic accidents scenario in India, Characteristics of accidents, accidents vs. crash, land use and road environment for safety, Multidisciplinary approach to planning for traffic safety and injury control; pre crash and post crash models; roles of vehicle, roadway traffic, driver, and environment, crash and injury causations; accident analysis, conflict points at intersections, pedestrian safety, road safety improvement strategies.

Module 2**Road safety audit and analysis:**

Stages, aim and objectives, principles, process, roles and responsibility, Specific parameters, design standards, various stages of road safety audit, RSA for rural roads, Checklists, Structuring of report.

Module 3

Steps in treatment of crash locations, diagnosing crash problem and solutions, accident report form, storing of data, using and interpreting crash data, identifying and prioritizing hazardous locations, condition and collision diagrams; Vulnerable road users: crashes related to pedestrian and bicyclists, their safety, provision for disabled; Crash reconstruction: understanding basic physics, calculation of speed for various skid, friction, drag, and acceleration scenarios.

Module 4**Engineering measures:**

Speed humps, speed bumps, speed tables, speed cushions; Community awareness and education (Speed limits); Enforcement- Non-physical measures- physical measures.

Module 5**Energy related aspects of different transport technologies:**

Traffic calming measures, road transport related air pollution, sources of air pollution, effects of weather conditions, vehicular emission parameters, pollution standards, measurement and analysis of vehicular emission; imitative measures, urban and non urban traffic noise sources, noise pollution, technology vision-2020

Text/Reference Books:

1. Evans S.K., Traffic Engineering Handbook, Institute of Traffic Engineers, USA
2. Wohl M., Martin B.V., Traffic system analysis of Engineers & Planners, McGraw Hill, New York.
3. Babkov V.F., Road conditions & Traffic Safety, MIR Publishers, Moscow, 1975
4. Kadiyali L.R., Traffic Engineering & Transport Planning, Khanna Publishers, 2003
5. Little A.D., The state of art of Traffic Safety, Paraeger Publishers, New York, 1970
6. Relevant IRC codes,
7. Indian Roads Congress, Highway Safety Code, IRC: SP-44:1996
8. Indian Roads Congress, Road Safety Audit Manual, IRC:SP-88-2010

MTE 210 HIGHWAY CONTRACT DOCUMENTS & TENDERING SYSTEMS

3L+0T+0P+3C

MM: 100

Module 1

Introduction to contracts: Definitions, Essentials for a legally valid contract, Salient features of contract, Discharging of a contract, Documents for an Engineering Contract; Types of contracts: Classification Based on – Tendering Process, Economic Consideration, Applicability of the various types of contracts in Construction.

Module 2

Tendering process: Definitions, List of Documents, EMD, Security Deposit, Invitation for Tenders and sale of Documents, Preparation of Tender Documents and its submission, Receipt of Tender Documents and its opening, Evaluation of Tender and Award of contract – Letter of Award, Letter of Intent, Issues in tendering process: Pre - Registration, Pre – Qualification, Nominated Tendering, Rejection of Tenders, Repeat Orders, Revocation of Tenders, Unbalanced Bidding.

Module 3

Administration/Performance of contract: Responsibilities (Duties and Liabilities) of Principal & Contractor, Monitoring and Quality control/assurance, Settlement of claims – Advances, Bills, Extension for time, Extras & Variations, Cost Escalations. Security Deposit, Retention Money, Performance Bond, Liquidated Damages, Penalties, Statutory Requirements.

Module 4

Breach of contract: Definition and Classification, Common Breaches by – Principal, Contractor, Damage Assessment, Claims for Damages.

Module 5

Dispute resolution: General, Methods for dispute resolution – Negotiations, Mediation, Conciliation, Dispute Resolution Boards, Arbitration, Litigation/Adjudication by courts. Conciliation – Appointment of Conciliator, Role of Conciliator, Special Features of Conciliation Dispute Resolution Boards (DRB) – Constitution Of DRB, Functioning of DRB, Procedure for Hearings, Status of Award.

Text/Reference Books:

1. Vaid K.N., (1998)"Global perspective on International Construction Contracting Technology and Project Management", NICMAR, Mumbai
2. Prakash V. A.,(1997) "Contracts Management in Civil Engineering Projects", NICMAR
3. Patil B. S.,(2009) "Civil Engineering Contracts and Estimates", University Press.
4. John G. Betty(1993/ Latest Edition) "Engineering Contracts", McGraw Hills.
5. Vasavada B. J., (1997), "Engineering Contracts and Arbitration", (Self Publication by Jyoti B. Vasavada).
6. Albett Robert W., (1961/ Latest Edition) "Engineering Contracts and Specifications", John
7. Willey and Sons, New York.

MTE 211 ENVIRONMENTAL IMPACT ASSESSMENT OF HIGHWAY PROJECTS

3L+0T+0P+3C

MM: 100

Module 1

Introduction: Concepts of environmental impact analysis, key features of National environmental policy act and its implementation, screening in the EIA process, utility and scope of EIA process.

Module 2

Environmental protection acts EIA at national level. Conceptual approach for environmental impact studies, planning and management of impact studies, matrix and network methodologies for impact identification, description of the affected environmental – environmental indicators.

Module 3

Prediction and Assessment of Impact on Air Environment: Basic information on air quality, sources of air pollutants, effects of air pollutants, key legislations and regulations, conceptual approach for addressing air environment impacts, impact prediction approaches, assessment of significance of impacts, identification and incorporation of mitigation measures.

Module 4

Prediction & Assessment of Impact on Noise & Social Environment: Basic information on noise, key legislation and guidelines, conceptual approach for addressing noise environment impacts, impact prediction methods, assessment of significance of impacts, identification and incorporation of mitigation measures, Conceptual approach for addressing socio-economic impacts, traffic and transportation system impacts, visual impacts, scoring methodologies for visual impact analysis.

Module 5

Decision Methods for Evaluation of Alternative: Development of decision matrix. Public participation in environmental decision making, Regulatory requirements, environmental impact assessment process, objectives of public participation, techniques for conflict management and dispute resolution, verbal communication in EIA studies.

Text/Reference Books:

1. Canter L.W., Environmental Impact Assessment, McGraw-Hill, 1997
2. Betty Bowers Marriott, Environmental Impact Assessment: A Practical Guide, McGraw-Hill Professional, 1997.
3. Peter Morris & Riki Therivel, Methods of Environmental Impact Assessment, Routledge, 2001.
4. Denver Tolliver, Highway Impact Assessment, Greenwood Publishing Group, 1993.
5. R. K. Jain, L. V. Urban, G. S. Stacey, H. E. Balbach, Environmental Assessment, McGraw-Hill Professional, 2001.

MTE 212 TRANSPORT ECONOMICS FINANCE**3L+0T+0P+3C****MM: 100****Module 1****Introduction and Overview:**

Introduction to transport economics, overview of basic components of transport, transport and economic development, transport and urban development, Economic theory, transport as an economic activity, demand and supply issues in transportation sector, cost of transport, pricing of transport, law of diminishing returns, demand, supply, equilibrium, elasticity, consumer surplus, costs, pricing and subsidy policies.

Module 2

Demand for Transportation: Demand forecasting methods, factors influencing transport demand, direct and cross-price elasticities of demand, factors that cause shifts in demand function.

Module 3

Costs of Transport: Direct and External costs of transport, concept of generalised costs, social aspects of transport, joint and common costs of infrastructure, short-term and long-term costs of supply, Congestion costs, External costs.

Module 4

Pricing of Transport Services: Pricing principles: the marginal cost pricing rule, efficient pricing, cost complexities and cost recovery, Peak-load pricing, Second-best pricing, Transport subsidies, Price discrimination.

Module 5

Appraisal and Evaluation of Transport Projects: Feasibility and evaluation, cost, impacts and performance levels, evaluation of alternatives, analysis techniques, cost-benefit analysis, social and financial benefits, valuation of time, measures of land value and consumer benefits from transportation projects, prioritization of projects, multi-criteria decision assessment.

Text/Reference Books:

1. Emile Quinet and Roger Vickerman, Principles of Transportation Economics, Edward Elgar Publishing.
2. Kenneth A. Small and Erik Verhoef, The Economics of Urban Transportation, Routledge.
3. Patrick Mccarthy, Transportation Economics, Blackwell Publishing.
4. Kenneth J. Button, Transport Economics, Edward Elgar Publishing.

MTE 213 AIRPORT PLANNING & DESIGN

3L+0T+0P+3C

MM: 100

Module 1

Growth and Characteristics of Airport and Aircraft: Growth of air transport, airport organization and associations, Classifications of airports airfield components, airport traffic zones and approach areas. Aircraft Components, size turning radius, speed, airport characteristics.

Module 2

Capacity and Delay, Airport planning, surveys and Design: Factors affecting capacity, Determination of runway capacity related to delay, gate capacity, and Taxiway capacity Airport Site Selection, Runway length and width, sight distances, longitudinal and transverse grades, runway intersections, taxiways, clearances, aprons, numbering, holding apron, noise control, Problems.

Module 3

Airport Grading, Planning and Design of the Terminal area: Operational concepts, space relationships and area requirements, vehicular traffic and parking at airports. Grading of airport area, hydrology

Module 4

Airport Drainage: design of drainage systems, construction methods, layout of surface drainage and subsurface drainage system, Problems.

Module 5

Air Traffic Control and Aids: Runways and taxiways markings, day and night landing aids, airport lighting, ILS and other associated aids.

Text/Reference Books:

1. Airport Planning and Design"- Khanna, Arora and Jain, Nem Chand and Bros., Roorkee
2. Airport Engineering - Rangwala, Charotar., Publisher
3. Virender Kumar and Satish Chandra, "Airport Planning and Design"- Galotia Publication press
4. Planning and Design of Airports" - Robert Horenjeff, 2nd edition, McGraw Hill Book Co.

MTE 214 RURAL ROAD TECHNOLOGY

3L+0T+0P+3C

MM: 100

Study of Code IRC 72, SP-20 and Specification for Rural Road-Indian Road Congress.

MTE 203 SEMINAR-II**0L-0T-4P-2C****MM 100**

Students will be grouped in two to three; will have to decide final research area of thesis, download research papers from ACME, ASCE, IS-CODES, Elsevier, Springer etc. This activity may also require visiting Learning Resources Centre of other institute of national importance.

Summarizing paper – Reading abstracts and finding ideas, conclusion, highlight of their approach and the drawbacks of the papers. Generalize results from a research paper to related research problems.

Comparing the approach -identify weaknesses and strengths in recent research articles in the subject. Practice sessions on how to read, analyze and summarize research papers. Students in group will have to deliver *presentation*, prepare a report and a review paper based on analysis.

Internal continuous assessment marks are awarded based on the relevance of the topic, presentation skill, quality of the report and participation.

MTE 204 ADVANCED TRAFFIC ENGINEERING LAB & FIELD STUDIES

0L-0T-4P-2C

MM 100

List of Experiments:

1. Traffic surveys like traffic volume count, speed study, parking study, intersection turning movements, speed & delay study.
2. Moving observer survey.
3. Origin–destination surveys.
4. Road side and house hold interviews.
5. Road lighting.
6. Traffic noise measurement.
7. Measurement of road user characteristics.
8. Use of automatic traffic recording equipment.

MTE 302 SEMINAR - III

0L+0T+4P+2C

MM: 100

Objective: To assess the debating capability of the student to present a technical topic. Also to impart training to students to face audience and present their ideas and thus creating in them self esteem and courage that are essential for engineers.

Individual students are required to choose a topic of their interest from Transportation Engineering related topics preferably from outside the M.Tech syllabus and give a seminar on that topic about 30 minutes. A committee consisting of at least three faculty members shall assess the presentation of the seminar and award marks to the students. Each student shall submit two copies of a write up of his/her seminar topic. One copy shall be returned to the student after duly certifying it by the chairman of the assessing committee and the other will be kept in the departmental library. Internal continuous assessment marks are awarded based on the relevance of the topic, presentation skill, quality of the report and participation.

MTE 303 DISSERTATION PART- I**0L+0T+10P+5C****MM: 100**

Objective: To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes. The project work aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.

The student is required to undertake the master research project phase 1 during the third semester and the same is continued in the 4th semester (Phase 2). Phase 1 consist of preliminary thesis work, two reviews of the work and the submission of preliminary report. First review would highlight the topic, objectives, methodology and expected results. Second review evaluates the progress of the work, preliminary report and scope of the work which is to be completed in the 4th semester. The Evaluation committee consists of at least three faculty members of which internal guide and another expert in the specified area of the project shall be two essential members. The technical paper is to be submitted along with the thesis

MTE 401 DISSERTATION PART- II**0L+0T+24P+12C****MM: 100**

Objective: To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes. The project work aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.

The student is required to undertake the master research project phase 1 during the third semester and the same is continued in the 4thsemester (Phase 2). Phase 1 consist of preliminary thesis work, two reviews of the work and the submission of preliminary report. First review would highlight the topic, objectives, methodology and expected results. Second review evaluates the progress of the work, preliminary report and scope of the work which is to be completed in the 4th semester. The Evaluation committee consists of at least three faculty members of which internal guide and another expert in the specified area of the project shall be two essential members. The technical paper is to be submitted along with the thesis