Faculty of Engineering & Technology

Syllabus

For

Master of Technology (M. Tech.)

Civil Engineering

(2017-18)

(Approved by the Academic Council vide Resolution No. ……dated…….)

FACULTY OF ENGINEERING & TECHNOLOGY

M.Tech Program in Civil Engineering with Specialization in

(ENVIRONMENTAL ENGINEERING)

SEMESTER I

THEORY PAPERS					**Marks Allocation**			
Code	**Subject/Paper**	**L**	**P**	**T**	**IA**	**EA**	**Total**	**Credits**
MTCEEV101	Energy & Environment	3	0	1	50	100	150	4
MTCEEV102	Advanced Water Treatment Technology	3	0	1	50	100	150	4
MTCEEV103	Advanced Waste Water Treatment Technology	3	0	1	50	100	150	4
Electives (Any One)								
MTCEEV104A	Statistical and Mathematical Techniques	3	0	1	50	100	150	4
MTCEEV104B	Noise and Thermal Pollution	3	0	1	50	100	150	4
MTCEEV104C	Environmental Geo technology	3	0	1	50	100	150	4
PRACTICALS/VIVA VOCE								
MTCEEV105	Advanced Water Treatment Lab	0	2	0	60	40	100	1
	TOTAL	12	2	4	260	440	700	17

SEMESTER II

THEORY PAPERS					**Marks Allocation**			
Code	**Subject/Paper**	**L**	**P**	**T**	**IA**	**EA**	**Total**	**Credits**
MTCEEV201	Environmental Policies & Legislation	3	0	1	50	100	150	4
MTCEEV202	Industrial Waste Treatment	3	0	1	50	100	150	4
MTCEEV203	Environment Impact Assessment & Auditing	3	0	1	50	100	150	4
Electives (Any One)								
MTCEEV204A	Solid Waste Management	3	0	1	50	100	150	4
MTCEEV204B	Hydrology And Applied Hydraulics	3	0	1	50	100	150	4
MTCEEV204C	Environmental Chemistry & Microbiology	3	0	1	50	100	150	4
PRACTICALS/VIVA VOCE								
MTCEEV205	Industrial Waste Treatment Lab	0	2	0	60	40	100	1
	TOTAL	12	2	4	260	440	700	17

THIRD SEMESTER								
THEORY PAPERS					**Marks Allocation**			
Code	**Subject/Paper**	**L**	**P**	**T**	**IA**	**EA**	**Total**	**Credits**
MTCEEV301	Air Pollution & Its Control	3	0	1	50	100	150	4
MTCEEV302	Hazardous Waste Treatment	3	0	1	50	100	150	4
MTCEEV303	Environment & Health	3	0	1	50	100	150	4
Electives (Any One)								
MTCEEV304A	Ground Water Pollution	3	0	1	50	100	150	4
MTCEEV304B	Planning And Design Of Environmental Facilities	3	0	1	50	100	150	4
MTCEEV304C	Indoor Air Quality	3	0	1	50	100	150	4
PRACTICALS/VIVA VOCE								
MTCEEV305	Seminar	0	0	0	60	40	100	2
	TOTAL	12	0	4	260	440	700	18

SEMESTER IV								
THEORY PAPERS					**Marks Allocation**			**Credits**
Code	**Subject/Paper**	**L**	**T**	**P**	**IA**	**EA**	**Total**	
MTCEEV401	Dissertation	0	0	0	300	400	700	12
	TOTAL				300	400	700	12

Note-:

The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format, thereafter he/she will have to present the progress of the work through seminars and progress reports. Seminar related to the project should be delivered one after starting of semester .The progress will be monitored through seminars and progress reports.

- **The Total Number of credits of the M-Tech (Civil Engineering) program=64.**
- **The award of the degree a student shall be required to earn the minimum of 60 credits.**

M.Tech. Program in Civil Engineering with Specialization in

(ENVIRONMENTAL ENGINEERING)

Choice Based Credit System (CBCS)

SEMESTER I

THEORY PAPERS					**Marks Allocation**			
Code	**Subject/Paper**	**L**	**P**	**T**	**IA**	**EA**	**Total**	**Credits**
MTCEEV101	Energy & Environment	3	0	1	50	100	150	4
MTCEEV102	Advanced Water Treatment Technology	3	0	1	50	100	150	4
MTCEEV103	Advanced Waste Water Treatment Technology	3	0	1	50	100	150	4
Electives (Any One)								
MTCEEV104A	Statistical and Mathematical Techniques	3	0	1	50	100	150	4
MTCEEV104B	Noise and Thermal Pollution	3	0	1	50	100	150	4
MTCEEV104C	Environmental Geo technology	3	0	1	50	100	150	4
PRACTICALS/VIVA VOCE								
MTCEEV105	Advanced Water Treatment Lab	0	2	0	60	40	100	1
	TOTAL	12	2	4	260	440	700	17

Energy & Environment (MTCEEV101)

UNIT 1

Introduction - Human Development, Socio-Economic Activities and Energy Needs; Introduction to Primary and Secondary Energy Resources; Introduction to Energy Conservation Technologies. Energy Needs (fuel types) of Domestic /Commercial Transport and Industrial Sectors; National and Global Energy Demand and Supply.

UNIT 2

Environmental Implications of Energy Use - Laws of Thermodynamics, Degradation of Energy; Fuel chain, Environmental Impacts at Different Stages of the Fuel Chain; Local, Regional and global Impacts; Waste Recycling and its impacts on Energy and Environment. Air Pollution from cooking Appliances, Vehicle and Power Plants, long term Emission Standards for Indian Industries and Transport Sector.

UNIT 3

Pollution Control Technologies in Energy Sector - Clean Fuels and Environmental Friendly Cooking and Heating Appliances, Emission Control from Diesel & Petrol Engines, New and Efficient Engines: Clean Combustion Technologies for Coal; Flue Gas Desulphurization & Recirculation; Advanced Burner Technology& Staged Firing; Selective Catalytic reduction.

UNIT 4

Energy Environment Models - Analysis and design of Environmental Policies; Decision Analysis, System Dynamics and Linear Programming Models for Designing Environmental Policies, Current Research on Energy environment Interactions.

UNIT 5

Environmental Economics - Environmental Benefits and cost of the use of various options including Fossil Fuels, Bio Gas, Solar and Wind Energy.

Reference Books:

1. Ecology of environment, Sharma, P D ,Rastogi Publishers.
2. Concept of ecology, karmondy.
3. Environmental Biology. Agrawal, K C , Nidhi publishers.

Advanced Water Treatment Technology (MTCEEV102)

UNIT 1

Water Quality Parameter, potable water, Significant water quality parameters for Municipal Water Supplies.Standards and Guidelines of Water for drinking purposes.

UNIT2

Water Treatment: Settling, types of , Discrete particle settling, Flocculent Settling, Theory of Tube Settlers, Plate Settlers, Choice of Clarifires, Ideal sedimentation Tank Concept. Coagulation, Theory, Chemistry and Mechanism of Coagulants, Coagulant Aids, Flocculation, Orthokinetic, Perikinetic, Mean Velocity Gradient. Long Rectangular Basin, Circular Basin

UNIT 3

Design of Clariflocculators. Filtration, Theory of, Carman Kozeny equation, Filter Arrangement, Filter operation.

UNIT 4

Disinfection, Types of, Mechanisms of, Factors Influencing Efficiency of Disinfectants, Chlorine Chemistry, Chlorinator. Process and Application of Ion Exchange, Adsorption, Reverse Osmosis, Electrodialysis. Use of bleaching power

UNIT5

Water softening : introduction, necessity of water softening,removal of temporary hardness, removal of parmanent hardness, lime soda process, base exchange process, demineralisation process, study of water softening plant

Reference Books:

1. CASEY. T.J. " Unit Treatment Processes in Water and Wastewater Engineering ", John Wiley & Sons England 1993

2. Birdie G.S.&J.S."Water supply engineering"dhanpat rai nmew delhi

Advanced Waste Water Treatment Technology (MTCEEV103)

UNIT 1

Introduction and Reuses of waste water: Waste Water Characteristics and their significance. B.O.D. Nitrification .Comparison of various methods of Determination of Organics. Screens, Grit Chamber, Floatation. Sedimentation, Zone Settling, Classification of biological Waste water Treatment Process, Aeration of Waste Water. Industrial, Agricultural and domestic reuses. Concept of Gray water and uses

UNIT 2

Wastewater Treatment Fundamentals : Flow sheets, Physico-chemical and biological processes. Screens comminutors. Grit chambers, Sedimentation, Equalization, Neutralization , Floatation and chemical treatment of waste waters.

UNIT 3

Biological Treatment Processes: Fundamentals of Monods Kinetics and application in bioreactor Design Aerobic and anaerobic, Suspended – growth and Attached – growth treatments, Types, Modifications, Activated – sludge unit, Trickling filters, Aerated lagoons, Stabilization ponds, Oxidation ditches, Aerators.Theory of sludge handling treatment and disposal.

UNIT 4

Sludge Treatment : Sludge Sources, Characteristics, Volume- Mass relationship, Sludge

Stabilization, Conventional and High Rate Digesters, Gas Production, Collection, Disposal of Sludge.Treatment system Chemical ,Biological, Incineration and Disposal of sludge solids.

UNIT 5

Advances in Wastewater Treatment : Nitrification, Denitrification, Phosphorousand other neutrient removal treatment processes , Total dissolved solid removal methods Introduction Use members and nano-technological -processes for wastewater treatment.

Reference Books:

1. METCALF & EDDY, INC. " Wastewater Engineering - Treatment, Disposal, and Reuse ", Third Edition, Tata McGraw-Hill Publishing CompanyLimited, New Delhi 1995.
2. CASEY. T.J. " Unit Treatment Processes in Water and Wastewater Engineering ", John Wiley & Sons England 1993.

Statistical and Mathematical Techniques (MTCEEV104A)

UNIT 1

Linear Programming: Formulation of the Linear Programming problem, Graphical methods for solving LP problems, Simplex method, Big M-method and Two-Phase simplex method, Duality: Definition of the dual problem, relationship between the primal and dual solutions, Formulation of dual problem.

UNIT 2

Dual Simplex method, Formulation of a transportation problem, North-west corner rule, row or column Minima method, Lowest cost entry method, Vogel"s Approximation (or Penalty) method (VAM),Degeneracy in Transportation problems, Assignment problem.

UNIT 3

Probability Distribution: Random variables (discrete & continuous random variables), Probability mass function and Probability density function, mean, variance of Binomial, Poisson, Normal, Exponential, Fitting of the distributions.

UNIT 4

Regression and Correlation: Karl Pearson's coefficient of correlation, Spearman's rank correlation coefficient, Lines of regression, Error of prediction. Method of least square- curve fitting of straight line, parabola, exponential curve

UNIT 5

Statistical inference: Types of sampling, standard error, sampling distribution of mean and variance. Testing of hypothesis, Level of significance (large samples), Confidence limits, Estimation of parameters of the population (point estimation & interval estimation), t-distribution, testing for difference between

means of two small samples, Chi-square distribution, degree of freedom, goodness of fit, Fisher's Z-Distribution.

RECOMONDED REFERENCE BOOKS:

1. "Fundamental of Mathematical Statistics", Gupta, S. C. and Kapoor,V.K.,S.Chand and Sons.
2. "Advanced Engineering Mathematics" by H. K. Dass, S.Chand and Sons.
3. "Higher Engineering Mathematics" by B.S.Grewal, Khanna Publisher.
4. "Higher Engineering Mathematics" by B.V. Ramana, Tata McGraw Hill.
5. "Advanced Engineering Mathematics" by R. K. Jain, S. R. K. Iyengar,Tata McGraw Hill.

Noise and Thermal Pollution (MTCEEV104B)

UNIT 1

Physics and effects of noise: - sources of noise, Frequency and Sound Levels, Units of Noise based power ratio, Contours of Loudness. Effects on Human, Environment and Properties.

UNIT 2

Sources and Monitoring of Noise Pollution: - Natural and Anthropogenic Noise Sources, Measuring Instruments for Frequency and Noise levels, Masking of sound

UNIT 3

Noise Sampling, list of BIS code books on noise pollution, Impacts of noise on Annoyance, Physiological effects. Loss of hearing, human performance, Nervous system, Sleeplessness, Damage to material etc

Unit 4

Control of Noise Pollution: - Treatment of noise Control at source, Control in the transmission path, using protective equipment

UNIT 5

Basics of Thermal Pollution: Waste heats into Water and other environments Sources, Effects and Control, Effects on Environment, Macro and Micro aquatic organisms . Effects case studies, methods of Control: Cooling towers and nuclear reactor cooling systems.

Reference Books:

1. Noise Pollution by Tripathy, Debipras (latest edition)
2. Environmental Pollution , Agrawal K C Nidhi publishers.

Environmental Geo-technology (MTCEEV104C)

UNIT 1

The Earth Systems and Biosphere: Conservation of matter in various geo-spheres –lithosphere, hydrosphere, atmosphere and biosphere. Energy budget of the earth. Earth's thermal environment and seasons. Climates of India, Indian Monsoon, Climatic variability and climate change, earths process and geological metrological Hazardous,Natural hazardous and extreme weather events, Flood and droughts in introductory ideas about air pollutions and global warming.

UNIT 2

Earth's Processes and Geological Hazards: Earth's processes; concepts of residence,time and rate of natural cycles. Catastrophic geological hazards. Study of floods, landslides,earthquakes, volcanism and avalanche. Perception of the hazards and adjustments to hazardous activities.

UNIT 3

Mineral Resources and Environment: Resources and Reserves, Minerals and population.Oceans and new areas for exploration of mineral resources. Ocean and recycling of resources. Environmental impact of exploitation, processing and smelting of minerals.

UNIT 4

Acid Mine Drainage: Formation of AMD**,** Chemistry of AMD, Microbiology of AMD, Iron Oxidation**,** Effect of AMD.

UNIT 5

Remote Sensing and GIS: Principles of Remote Sensing and its application of Environmental Science. Application of GIS in Environmental Management.

Reference Books:

1. Valdiya, K.S. 1987, Environmental Geology.
2. Keller, E.A. Environmental Geology & Turk and Turk.
3. Environmental Geology – DR Coates, John Wiely & Sons, NY 1981

Advanced Water Treatment Lab (MTCEEV105)

List of Experiments

1. To determine the pH of the given sample of water.

2. To determine the turbidity of the given sample of water

3. To determine Total Solids of the given water sample.

4. To determine the Total Dissolved Solids of the given water sample.

5. To find out conductivity of the given water sample.

6. To determine hardness of the given water sample.

7. To find out chloride of the given water sample.

8. To determine alkalinity of the given water sample.

9. To find out acidity of the given water sample.

10. To determine the optimum dose of alum by Jar test.

12. To study various water supply Fittings

SEMESTER II								
THEORY PAPERS					**Marks Allocation**			
Code	**Subject/Paper**	**L**	**P**	**T**	**IA**	**EA**	**Total**	**Credits**
MTCEEV201	Environmental Policies & Legislation	3	0	1	50	100	150	4
MTCEEV202	Industrial Waste Treatment	3	0	1	50	100	150	4
MTCEEV203	Environment Impact Assessment & Auditing	3	0	1	50	100	150	4
Electives (Any One)								
MTCEEV204A	Solid Waste Management	3	0	1	50	100	150	4
MTCEEV204B	Hydrology And Applied Hydraulics	3	0	1	50	100	150	4
MTCEEV204C	Environmental Chemistry & Microbiology	3	0	1	50	100	150	4
PRACTICALS/VIVA VOCE								
MTCEEV205	Industrial Waste Treatment Lab	0	2	0	60	40	100	1
	TOTAL	12	2	4	260	440	700	17

Environmental Policies & Legislation (MTCEEV201)

UNIT 1

Introduction: Role of national, international, and UN agencies in dealing with the environmental aspects. Standards and setting criteria.

UNIT 2

Historical aspects: major legislations: USEPA 1969 to Clean Water and Air Act. significant legislations in developing and developed countries.

UNIT 3

Legislations in Indian context: Indian Forest Act 1950, 1980, and amendments. Acts related to air and water pollution.

UNIT 4

Norms & Standards: OHSHAS 18001 and its significance. ISO 14000 and its significance, other acts in ESE and case studies. Feasibility Studies and Management issues.

UNIT 5

Related Issues: Principles of sustainable development and implications of finite biosphere and complexities for engineering design and decision-making. Design of controlled environments to enhance health and protection of natural resources for sustainable development. Resource problems and design with ecological, economic, demographic and social dimensions. Techniques to integrate knowledge and define policy.

Reference Books:

1. Meyers A. Robert (Eds.) Encyclopedia of Environmental Analysis and Remediation Vol. 1-8,John Wiley & Sons, 1998.
2. Handbook of Accident prevention, ILO Publication, 1998.
3. Encyclopedia of Industrial Safety and Health, 1999.
4. G.M.Masters, Introduction to Environmental Engineering & Science, Prentice Hall, New Delhi,1997
5. J.G. Henry and G. W. Heike, Environmental Science & Engineering", Prentice Hall International Inc., New Jersy, 1996.

Industrial Waste Treatment (MTCEEV202)

Unit 1.

Comparative study of industrial waste water with municipal waste water, Industrial waste water problems in India: Effects of discharges of Industrial Waste of Receiving Bodies of Water, Land and Sewer. Effluent and Stream Standards. Historical Development of law related to environmental Protection, Salient feature of Water Act- 1974, Air Act 1981 and Environmental (Protection) Act 1986

Unit 2.

Water use in industry, Industrial water quality requirements, Deterioration of water quality, Classification and characterization of Industrial wastewater, Monitoring of wastewater flow in industries, Quality and quantity variations in waste discharge, Water budgeting.

Unit 3

Specific Industrial Treatment Processes : Neutralization, Equalization and Proportioning, Volume and strength reduction. Treatment techniques for removal of specific pollutants in industrial wastewaters, e.g., oil and grease, cyanide, fluoride, calcium, magnesium, toxic organics, heavy metals, radioactivity.

Unit 4.

Raw materials, Water requirements, Process Characteristics, Composition, effects and treatment, flow sheet of Industrial Waste Waters generated from: Textile (Cotton and Synthetic), tannery, Pulp and Paper, Dairy, Metal Plating (Chromium and Cyanide problem), Slaughter house, Distillery, Dyeing and printing, Fertilizer, Copper & Cement Industry. Provision of various Indian Standards for above Industries.

Unit5.

Potential of Wastewater Recycle and Reuse in Industries, Concept of Common Effluent Treatment Plants.

Recommended Books :

1. Theories and Practices of Industrial waste treatment- Nelson Nemerow.
2. Waste water treatment: M.N.Rao & Datta.
3. IS Standard guide for treatment and disposal of various industries

Environmental Impact Assessment and Auditing (MTCEEV203)

Unit 1

Introduction to Environmental Impact Analysis: Terms-environment, Impact and assessment, concept of EIA, Environmental settings, Prediction and assessment of impact on physical, biological and socio-economic environment.

Unit 2

Methods of Analysis of Impacts on Environment: Adhoc, Checklist, Matrix, Network, environmental Media quality Index Method, Cost Benefit Analysis**.**

Unit 3

Public Participation: Concept, Public hearing procedure and guidelines.

Unit 4

Location of Industries: Environmental impacts of typical industries, power plants, large projects, present scenario of various government resolutions on selecting the location of industries, environmental point of view.

Unit 5

Case Histories of Engineering Projects like Energy Generation Projects both thermal and Hydal , Infra-structure projects , Power Transmission etc..

Recommended Books :

1. Environmental Impact Assessment, Canter Mc Graw Hill Pub.
2. Environmental Impact Analysis. R.K. Jain, L. V. Urban and G.S. Stacey Publishers : van Nostrand reinhold New York
3. Environmental Impact Analysis. Hand book by John Ray and David W

4. Peter Watten (Eds.) - `Environmental Impact Assessment Theory and Practice', Unwin Hyman, London (1988)

5. Theory and Practice of Environmental Impact assessment: By Abbasi and Ramesh

6. Environmental Impact Assessment: By Shrivastava

Solid Waste Management (MTCEEV204A)

Unit 1

Solid waste management: Objectives, Functional elements, Environmental impact of mismanagement. Solid waste: Sources, Types, Composition, Quantities, Physical, Chemical and Biological properties.

Unit 2

Solid waste generation rate: Definition, Typical values for Indian cities, Factors affecting. Storage and collection: General considerations for waste storage at source, Types of collection systems. Transfer station: Meaning, Necessity, Location, Economic analysis. Transportation of solid waste: Means and methods, Routing of vehicles.

Unit 3

Sorting and material recovery: Objectives, Stages of sorting, Sorting operations, Guidelines for sorting for material recovery, Typical material recovery facility for a commingled solid waste.

Unit 4

Composting of solid waste: Principles, Methods, Factors affecting, Properties of compost Vermicomposting. Energy recovery from solid waste: Parameters affecting, Biomethanation, Fundamentals of thermal processing, Pyrolysis, Incineration, Advantages and disadvantages of various technological options.

Unit 5

Landfills: Definition, Essential components, Site selection, Land filling methods, Leachate and landfill gas management.

Recommended Books :

1. Manual on municipal solid waste management – Government of India publication.
2. Integrated solid waste management – George Tchobanoglous. Mcgraw Hill
3. Solid waste management handbook– Pavoni.

Hydrology and Applied Hydraulics (MTCEEV204B)

Unit 1

Evaporation and infiltration : measurement and estimation of evaporation from land and water surfaces. Infiltration, factors affecting infiltration. Surface runoff, overland flow, factors affecting runoff. Hydrograph analyses, Unit hydrograph, channel and storage routing.

Unit 2

Fundamentals of ground water flow : Occurrence of Ground Water, Vertical Distribution of Ground Water, Darcy's law, Permeability, Porosity, Anisotropic Aquifers, Differential equations of Ground water flow.

Unit 3

Ground Water Development : Well development, Artificial recharge, Salinity of Ground water, Ground water pollution, Infiltration Galleries.

Unit 4

Water and wastewater pumping : Classification, selection, installation, operation and maintenance of pumps for water and wastewater pumping, electrical motors, choice and installation, starters and other accessories

Unit 5

Rainfall intensity-duration –frequency curves.

Design of drainage system elements, control of storm water pollution., Introduction to optimization of water distribution system, principles of sewers

Recommended Books :

1 Seth-modi, applied hydraulic

2 Arora k.r., fluid mechanics

ENVIRONMENTAL CHEMISTRY & MICROBIOLOGY (MTCEEV204C)

UNIT 1

Physical Chemistry: Thermodynamics, Free Energy, osmosis, dialysis, law of mass action, chemical equilibrium, basic concepts of chemical kinetics.

UNIT 2

Biochemistry: Biochemistry of carbohydrates, proteins, fats and oils, Enzymes, buffers, EMP and TCA pathways, electron transport mechanism and oxidation phosphorylation, photosynthesis.

UNIT 3

General Chemistry: Henry's law, activity coefficients, ionization of weak bases, and acids, solubility product, Common ion effect, ways of shifting chemical equilibria, Adsorption isotherms.

UNIT 4

Microbiology: Morphology and classification of bacteria, algae, fungi and viruses, elements of microscopy, Microorganisms of various aerobic and anaerobic biological waste treatment units, culture

media for microorganisms, sterilization. Culture of microorganisms in batch and continuous reactors, energy and kinetics of microbial growth and metabolism and biological fate of pollutants.

UNIT 5

Microbiology of water, soil and air, Water and air borne diseases and their causative organisms, concept of indicator organisms. Tests for coli- forms and streptococci and their significance, MPN and MF techniques, bacteriological standards.

Recommended Books :

1.Rose E Mckanney. Microbiology for sanitary engineers-

2. Gamey and Lord. Microbiology for waste water and sewage

3. Pelczhar and Reid. Test book of microbiology.

4. Standard methods . APHA.

5. Roger T Stainer and Michael Dandroff. General Microbiology

Industrial Waste Treatment Lab (MTCEEV205)

List of Experiments:-

1. To determine the pH of the given sample of Industrial Waste.

2. To determine Total Solids of the given Industrial Waste sample.

3. To determine the Total Dissolved Solids of the given Industrial Waste sample.

4. To find out Total Settle-able Solids of the given Industrial Waste sample.

5. To determine Total Suspended Solids of the given Industrial Waste sample.

6. To find out the Quantity of Dissolved Oxygen present in the given Industrial Waste sample by Winkler's Method.

7. To determine Biochemical Oxygen Demand exerted by the given Industrial Waste water sample.

8. To find out Chemical Oxygen Demand of the Industrial Waste water sample.

9. To study various Sanitary Fittings.

10. Design problems as per syllabus of theory

THIRD SEMESTER								
THEORY PAPERS					**Marks Allocation**			
Code	**Subject/Paper**	**L**	**P**	**T**	**IA**	**EA**	**Total**	**Credits**
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MTCEEV302	Hazardous Waste Treatment	3	0	1	50	100	150	4
MTCEEV303	Environment & Health	3	0	1	50	100	150	4
Electives (Any One)								
MTCEEV304A	Ground Water Pollution	3	0	1	50	100	150	4
MTCEEV304B	Planning And Design Of Environmental Facilities	3	0	1	50	100	150	4
MTCEEV304C	Indoor Air Quality	3	0	1	50	100	150	4
PRACTICALS/VIVA VOCE								
MTCEEV305	Seminar	0	0	0	60	40	100	2
	TOTAL	12	0	4	260	440	700	18

Air Pollution and It's Control (MTCEEV301)

Unit 1

Sources and classification : Classification of aerosols, gases vapors, natural air pollutants, properties of air pollutants.

Unit 2

Meteorology : Factors influencing air pollution, wind roses, plume behavior, estimation of plume rise.

Unit 3

Air pollution modeling : Dispersion models – Basquill model, ASME model, Gaussian plume model assumptions, limitations.

Unit 4

Effects of Air Pollutants : Effect on man, material, vegetation, art treasurers. Air pollution disasters, Economic effects.

Unit 5

Global effects of Air Pollutants : Green house effect, acid rains, ozone hole, heat islands.

Air pollution due to automobiles : Vehicular emissions, motor fuel combustion, automobile emission control, general concepts of transport planning for prevention of air pollution.

Recommended Books :

1. Air Pollution Control Engineering by N.D. Nevers (1995) MC Graw Hill
2. Air Pollution by H.C. Perkins MC Graw Hill (latest edition)
3. Air pollution: By K Wark and C Warner
4. Air Pollution control: By De Nevers
5. Environmental Pollution control engineering: By C S Rao
6. Air pollution control: By Howard and Hesketh
7. Air Pollution Volume I to VII: By Stern
8. Air Pollution: By Seinfeld

Hazardous Waste Treatment (MTCEEV302)

Unit 1

Hazardous Waste: Definition, Magnitude of Problem, Public and Government awareness of Hazardous Waste, Definition of Hazardous Waste under RCRA. Basic idea of the Hazardous Waste (Management and Handling) Rules, 1989.

Unit 2

Exposure and Risk Assessment: Introduction, Hazard Identification, Process of Risk Assessment, Toxicity Assessment, Risk Characterization and Remediation.

Unit 3

Environmental Legislation: EPA obligations and Responsibilities. Hazardous Waste Management and Handling Rules. Environment Management Systems (EMS).

Unit 4

Waste Minimization : Introduction to Government Policy in Waste Reduction. Benefits of Hazardous Waste Reduction. Approaches to Hazardous Waste Reduction. Priorities in Hazardous Waste Management.

Unit 5

Treatment : Physical, Chemical and Biological Treatment of Hazardous Waste.

Recommended Books :

1. Hazardous Waste minimization: By Harry M Freeman, McGraw Hill publications.
2. Hazardous Waste Management: By LaGrega.

Environment & Health (MTCEEV303)

Unit1

Dimensions of environmental health, causative agents of diseases, social factors, urban problems, housing and health, economy and health, climate and other atmospheric elements, violence, crime and mental health, family health practice, health care planning and delivery, chronic and communicable disease, worldwide nutrition and population control.

Unit 2

Industrial and agricultural pollutants, occupational health, epidemiological data, occupational health hazards, environmental exposure and diseases, industrial toxicants, hazardous wastes, preventing exposure to unhealthy and unsafe working conditions ,vector control.

Unit 3

Disease control, disease prevention, morbidity and mortality, diseases and progressive deterioration, controlling diseases and disability. Foodborne and waterborne diseases outbreaks, controlling stress of life, epidemiology

Unit 4

Nuclear energy and environmental health, concerns and uncertainties about nuclear power, , nuclear power plants, safety. Environmental health planning, need for planning, the planning process

Unit5

Environmental health services, various agencies, International efforts, role of industry, voluntary health agencies, Law and human welfare, constitutional right to healthy environment, environmental education.

Recommended Books :

1 Willgoose-Environmental Health

2 Morgan-Environmental Health

3 Cairncross and Feachem-Environmental Health engineering in tropics

4The world bank-Appropriate technology for water supply and sanitation

Ground Water Pollution (MTCEEV304A)

UNIT1.

WATER QUALITY: Natural occurrence of common solutes in water, Suspended & dissolved constituents,Principle chemical constituents in ground water, water quality criteria for drinking,Agricultural and Industrial uses, Quality of ground water resources.

UNIT 2

SOURCES OF POLLUTION Various sources & causes of ground water pollution. Activities generating contaminants, Types of contaminants & Mechanism of ground water pollution

UNIT 3

MOVEMENT OF POLLUTANTS: Principles of Pollutant movement (Darcy's law, Hydraulic Conductivity, Anisotropic Aquifer), Attenuation of pollution in the ground, Pollution dispersion in the ground. Ground water movement in saturated zone. Factors affecting Pathogen movement & Survival, Transportation equation, ground water remediation.

UNIT 4

PROBLEMS OF TOTAL DISSOLVED SOLIDS: Fluoride & Nitrate Pollution of ground water, Natural occurrence of Nitrates & sources related to man's activities.

UNIT 5

MONITORING GROUND WATER QUALITY General principles, Monitoring Management of Ground Water Quality, Section of Parameters for Monitoring. Economic considerations in ground water quality management.

Recommended Books :

1.Metcalf and Eddy Inc. - Waste water Engineering: Treatment, disposal & reuse,

Tata McGraw Hill

2.Peavy- Environmental Engineering, McGraw Hill

3.Rodger Walker- Water supply Treatment and distribution

4.Sinero- Environmental Engineering: A Design Approach, Prentice Hall of India, Delhi

5.Wilson- Design calculations in waste water treatment, McGraw Hill Kogakusha

Planning and Design of Environmental Facilities (MTCEEV304B)

Unit 1

Environmental Engineering hydraulic design: Water distribution systems- Design of distribution systems- Hydraulic analysis – Distribution system components – Storage tanks– Equivalent Pipe method

UNIT 2

Types of sewerage system —Design of various sewer appurtenances - Design of sanitary and storm water sewers – Structural requirement of sewer under various conditions – Design of surface and subsurface drainage – Roadways and Airport drainage

UNIT 3

Design of water treatment units – Clarifiers, Flocculators, Filter House, Hopper Bottom Tanks, Digesters

UNIT 4

Design of waste water treatment units – Design of screens, Grit chamber, Sedimentation tank, Activated sludge process, Trickling filter, Aerated lagoons, Stabilization ponds, Oxidation ditch, Septic tank, Imhoff tank, Sequencing batch reactor, Sludge digestion tank.

Unit 5

Underground Tanks, Retaining Wall and floor Junctions. Rectangular and Circular Tanks in R.C.C. and Steel, Intz Tanks, Steel and Concrete Staging

Recommended Books :

1.Metcalf and Eddy Inc. - Waste water Engineering: Treatment, disposal & reuse,

Tata McGraw Hill

2.Peavy- Environmental Engineering, McGraw Hill

3.Rodger Walker- Water supply Treatment and distribution

4.Sinero- Environmental Engineering: A Design Approach, Prentice Hall of India, Delhi

5.Wilson- Design calculations in waste water treatment, McGraw Hill Kogakusha

INDOOR AIR QUALITY (MTCEEV304C)

UNIT 1.

Indoor activities of inhabitants - Levels of pollutants in indoor and outdoor air- Design and

operation of buildings for improvements of public health- IAQ policy issues- sustainability.

UNIT 2.

Air pollutants in indoor environments- private residences- offices- schools-public buildingsventilation.

UNIT 3.

Control of several pollutant classes- radon- toxic organic gases- combustion byproductsmicroorganisms such as molds and infectious bacteria.

UNIT 4.

Concepts and tools- exposure- material balance models- statistical models.

UNIT 5.

Indoor air pollution from outdoor sources- particulate matter and ozone- Combustion byproducts- Radon and its decay products- Volatile organic compounds- odors and sickbuilding syndrome- Humidity- Bio aerosols- infectious disease transmission- Special indoor environments- A/C units in indoor- Measurement methods- Control technologies- Control strategies.

RECOMONDED REFERENCE BOOKS:

1. Thaddes Godish, *Indoor air and Environmental Quality*, CRC press, 2000.

2. Nazaroff W.W. and L. Alvarez-Cohen, *Environmental Engineering Science*, Wiley sons, Newyork, 2001.

SEMINAR (MTCEEV305)

SEMESTER IV								
THEORY PAPERS					**Marks Allocation**			**Credits**
Code	**Subject/Paper**	**L**	**T**	**P**	**IA**	**EA**	**Total**	
MTCEEV401	Dissertation	0	0	0	300	400	700	12
	TOTAL				300	400	700	12

Note-:

The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format, thereafter he/she will have to present the progress of the work through seminars and progress reports. Seminar related to the project should be delivered one after starting of semester .The progress will be monitored through seminars and progress reports.

- **The Total Number of credits of the M-Tech(Civil Engineering) program=64.**
- **The award of the degree a student shall be required to earn the minimum of 60 credits.**

Dissertation (MTCEEV401)

FACULTY OF ENGINEERING & TECHNOLOGY

M.Tech Program in Civil Engineering with Specialization in

(TRANSPORTATION ENGINEERING)

SEMESTER I

THEORY PAPERS					**Marks Allocation**			
Code	**Subject/Paper**	**L**	**P**	**T**	**IA**	**EA**	**Total**	**Credits**
MTCETE101	Traffic Engineering-I	3	0	1	50	100	150	4
MTCETE102	Highway Materials	3	0	1	50	100	150	4
MTCETE103	Pavement analysis and Design	3	0	1	50	100	150	4
Electives (Any One)								
MTCETE104A	Statistical and Mathematical Techniques	3	0	1	50	100	150	4
MTCETE104B	Ground Improvement Techniques	3	0	1	50	100	150	4
MTCETE104C	Intelligent Transportation system	3	0	1	50	100	150	4
PRACTICALS/VIVA VOCE								
MTCETE105	Ground Improvement Techniques Lab	0	2	0	60	40	100	1
	TOTAL	12	2	4	260	440	700	17

SEMESTER II								
THEORY PAPERS					**Marks Allocation**			
Code	**Subject/Paper**	**L**	**P**	**T**	**IA**	**EA**	**Total**	**Credits**
MTCETE201	Traffic Engineering II	3	0	1	50	100	150	4
MTCETE202	Urban Transportation Planning I	3	0	1	50	100	150	4
MTCETE203	Highway Geometric Design	3	0	1	50	100	150	4
Electives (Any One)								
MTCETE204A	Bridge Engineering	3	0	1	50	100	150	4
MTCETE204B	Transportation Planning	3	0	1	50	100	150	4
MTCETE204C	Highway Construction	3	0	1	50	100	150	4
PRACTICALS/VIVA VOCE								
MTCETE205	Highway Material Testing Lab	0	2	0	60	40	100	1
	TOTAL	12	2	4	260	440	700	17

THIRD SEMESTER								
THEORY PAPERS					**Marks Allocation**			
Code	**Subject/Paper**	**L**	**P**	**T**	**IA**	**EA**	**Total**	**Credits**
MCETE301	Pavement Management System	3	0	1	50	100	150	4
MCETE302	Urban Transportation Planning II	3	0	1	50	100	150	4
MCETE303	Traffic Flow Theory	3	0	1	50	100	150	4
Electives (Any One)								
MCETE304A	GIS Application in Transportation Engineering	3	0	1	50	100	150	4
MCETE304B	Transportation Facility Design	3	0	1	50	100	150	4
MCETE304C	Intelligent Transport System	3	0	1	50	100	150	4
PRACTICALS/VIVA VOCE								
MTCETE305	Seminar	0	0	0	60	40	100	2
	TOTAL	12	0	4	260	440	700	18

SEMESTER IV								
THEORY PAPERS					**Marks Allocation**			**Credits**
Code	**Subject/Paper**	**L**	**T**	**P**	**IA**	**EA**	**Total**	
MTCETE401	Dissertation	0	0	0	300	400	700	12
	TOTAL				300	400	700	12

Note-:

The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format, thereafter he/she will have to present the progress of the work through seminars and progress reports. Seminar related to the project should be delivered one after starting of semester .The progress will be monitored through seminars and progress reports.

- **The Total Number of credits of the M-Tech(Civil Engineering) program=64.**
- **The award of the degree a student shall be required to earn the minimum of 60 credits.**

M.Tech. Program in Civil Engineering with Specialization in

(Transportation Engineering)

SEMESTER I

THEORY PAPERS					**Marks Allocation**			
Code	**Subject/Paper**	**L**	**P**	**T**	**IA**	**EA**	**Total**	**Credits**
MTCETE101	Traffic Engineering-I	3	0	1	50	100	150	4
MTCETE102	Highway Materials	3	0	1	50	100	150	4
MTCETE103	Pavement analysis and Design	3	0	1	50	100	150	4
Electives (Any One)								
MTCETE104A	Statistical and Mathematical Techniques	3	0	1	50	100	150	4
MTCETE104B	Ground Improvement Techniques	3	0	1	50	100	150	4
MTCETE104C	Intelligent Transportation system	3	0	1	50	100	150	4
PRACTICALS/VIVA VOCE								
MTCETE105	Ground Improvement Techniques Lab	0	2	0	60	40	100	1
	TOTAL	12	2	4	260	440	700	17

Traffic Engineering-I (MTCETE101)

UNIT: 1. **Scope of Traffic Engineering & Study of its elements**: Introduction, Objectives and Scope of Traffic Engineering; Components of Road Traffic – Vehicle, Driver and Road; Road User and Vehicle Characteristics and their effect on Road Traffic; Traffic Manoeuvers. Traffic Stream Characteristics-Relationship between Speed, Flow and Density

UNIT :2. **Traffic Engineering Studies and Analysis**: Sampling in Traffic Studies, Adequacy of Sample Size; Objectives, Methods of Study, Equipment, Data Collection, Analysis and Interpretation (including Case Studies) of (a) Speed (b) Speed and Delay (c) Volume (d) Origin and Destination (e) Parking (f) Accidents.

UNIT :3. **Design of Traffic Engineering Facilities**: Control of Traffic Movements through Time Sharing and Space Sharing Concepts; Design of Channelising Islands, T, Y, Skewed, Staggered, Roundabout, Mini-roundabout and other forms of AT-Grade Crossings including provision for safe crossing of Pedestrians and Cyclists; Grade Separated Intersections, their Warrants and Design Features; Bus Stop Location and Bus Bay Design, Design of Road Lighting

UNIT : 4. **Traffic Control Devices:** Traffic Signs, Markings and Signals; Principles of Signal Design, Webster's method of Signal Design, Redesign of Existing Signals sincluding Case Studies; Signal System and Coordination.

UNIT : 5 Traffic Regulations and Control: General regulations; Regulations on Speed, Vehicles, drivers and flow; other regulations and control. Traffic management; noise and air pollution due to road traffic and method of control.

Suggested Books:

1. Pignataro, L., Traffic Engineering – Theory & Practice, John Wiley, 1973.

2. Kadiyali, L.R., Traffic Engineering and Transport Planning, Khanna publishers, 2007.

3. The Institute of Transportation Engineers, Transportation and Traffic Engg. Hand Book, Prentice Hall (1982) Chapters 8, 17, 21, 23 and 24.

4. O'Flaherty C A, Highways- Traffic Planning & Engineering, Edward Arnold, UK, 2002

5. McShane W R & Roess R P, Traffic Engineering, Prentice-Hall, NJ, 2010

6. IRC-SP41: Guidelines for the Design of At-Grade Intersections in Rural & Urban Areas

7. Salter, R J., Highway Traffic Analysis and Design, ELBS, 1996.

8. Matson, Smith and Hurd, Traffic Engineering, Mc-Graw Hill Book Co, 1955.

Highway Materials (MTCETE102)

UNIT : 1. **Aggregates:** Classification, physical and strength characteristics, Proportioning of aggregates, Aggregate texture and skid resistance, polishing of aggregates.

UNIT : 2. **Soil:** Classification, Structural and Constructional problems in soil subgrade, Identification and strength tests, Soil-moisture movement, Sub-soil drainage, Soil stabilization, Characteristics and use of Fly Ash, Bottom ash and Pond Ash.

UNIT :3. **Bitumen:** Bitumen sources and manufacturing, Bitumen constituents, structure and Rheology, Mechanical and engineering properties of bitumen, Tests on bitumen, Emulsions, Tar – Properties, types, modifications, Durability of bitumen, Adhesion of bitumen, Modified bitumen.

UNIT :4. Bituminous Mixes: Desirable properties of mixes, Design of bituminous mixes, Tests on bituminous mixes, Fillers, Theory of fillers and specifications. Marshall, Hubbard Field & Hveam Methods.

UNIT :5. Cement Concrete: Constituents and their requirements, Physical, plastic and structural properties of concrete, Factors influencing mix design, Design of concrete mixes for DLC and PQC with appropriate admixtures like flyash and high range water reducing admixtures etc.

Suggested Books:

1 Krebs, Robert D. And Walker, R. D., "*Highway Materials*", McGraw Hill Book Co., New York 1971

2 Her Majesty's Stationery Office, "*Soil Mechanics for Road Engineers*", Ministry of Transport, Road Research Laboratory, UK 1966

3 Her Majesty's Stationery Office, "*Bituminous Materials in Road Construction*", Ministry of Transport, Road Research Laboratory, UK 1966

4 Her Majesty's Stationery Office, "*Concrete Roads Design and Construction*", Ministry of Transport, Road Research Laboratory, UK 1966

5 Read, J. And Whiteoak, D., "*The Shell Bitumen Handbook*", Fifth edition, Shell Bitumen, Thomas Telford Publishing, London 2003

6 Relevant IRC and IS codes

PAVEMENT ANALYSIS AND DESIGN (MTCETE103)

UNIT : 1. Types and Component parts of Pavements and Subgrade

Types and Component parts of Pavements: Flexible, rigid and semi-rigid pavements Factors affecting design and performance of Pavements - Influence of environment on pavement - Frost, Sub grade moisture

Subgrade: Functions and significance of subgrade properties - Methods ofassessment of subgrade strength - Soil classification - Subgrade stabilization –Wheel loads – ESWL – EWLF

UNIT : 2. Flexible pavement design

Flexible pavement design: Analysis of Stresses in Flexible Pavements -Empirical, Semi-empirical and Theoretical Methods of Flexible Pavement Design– Problems

UNIT : 3. Rigid pavement design

Rigid pavement design: Types, Causes and Analysis of Stresses in Rigid pavements - Types, Functions and Spacing of Joints in Cement Concrete Pavements - Design of Slab Thickness and Joint Details

UNIT : 4. Pavement evaluation and rehabilitation

Pavement evaluation and rehabilitation: surface characteristics – skid resistance– pavement roughness - pavement distress - Strengthening of existing pavements -Flexible and Rigid Overlays – Recycling of Pavements - Systems approach to maintenance (PMS).

UNIT : 5. Road Construction: Bituminous road construction procedures and specifications, Quality control requirements. Concrete Road construction: Construction methods, Quality control requirements, Joints in cement concrete pavements, reinforced cement concrete road construction. IRC & MORTH recommendations for construction of Bituminous and Concreteroads. Present practices being followed for quality assurance and speedy construction in the country like by NHAI.

References:

1. Yoder and Witezak, “Principles of Pavement Design”, John Wiley and sons.

2. Yang, Design of functional pavements, McGraw-Hill.

3. Kadiyali L.R., “Principles & Practice of Highway Engineering”, Khanna Publishers,2003

4. Khanna S.K., Justo C.E.G., “Highway Engineering”, Nem Chand & Bros., Roorkee, 2001

5. IRC: 37-2001, “Guidelines for the Design of Flexible Pavements (Second Revision)”.

6. IRC: 58-2001, “Guidelines for the Design of Plain Jointed Rigid Pavements for Highways (Second Revision)”.

7. AASHTO – Design of pavement Structures

Statistical and Mathematical Techniques (MTCETE104A)

UNIT 1

Linear Programming: Formulation of the Linear Programming problem, Graphical methods for solving LP problems, Simplex method, Big M-method and Two-Phase simplex method, Duality: Definition of the dual problem, relationship between the primal and dual solutions, Formulation of dual problem.

UNIT 2

Dual Simplex method, Formulation of a transportation problem, North-west corner rule, row or column Minima method, Lowest cost entry method, Vogel"s Approximation (or Penalty) method (VAM),Degeneracy in Transportation problems, Assignment problem.

UNIT 3

Probability Distribution: Random variables (discrete & continuous random variables), Probability mass function and Probability density function, mean, variance of Binomial, Poisson, Normal, Exponential, Fitting of the distributions.

UNIT 4

Regression and Correlation: Karl Pearson's coefficient of correlation, Spearman's rank correlation coefficient, Lines of regression, Error of prediction. Method of least square- curve fitting of straight line, parabola, exponential curve

UNIT 5

Statistical inference: Types of sampling, standard error, sampling distribution of mean and variance. Testing of hypothesis, Level of significance (large samples), Confidence limits, Estimation of parameters of the population (point estimation & interval estimation), t-distribution, testing for difference between means of two small samples, Chi-square distribution, degree of freedom, goodness of fit, Fisher's Z-Distribution.

RECOMONDED REFERENCE BOOKS:

1. "Fundamental of Mathematical Statistics", Gupta, S. C. and Kapoor,V.K.,S.Chand and Sons.
2. "Advanced Engineering Mathematics" by H. K. Dass, S.Chand and Sons.
3. "Higher Engineering Mathematics" by B.S.Grewal, Khanna Publisher.
4. "Higher Engineering Mathematics" by B.V. Ramana, Tata McGraw Hill.
5. "Advanced Engineering Mathematics" by R. K. Jain, S. R. K. Iyengar,Tata McGraw Hill.

Ground Improvement Techniques (MTCETE104B)

UNIT I Introduction

Need for engineered ground improvement, classification of ground modification

techniques; suitability, feasibility and desirability of ground improvement technique;

objectives of improving soil.

UNIT II In-situ densification methods in granular soils & Cohesive soils

Introduction, Vibration at the ground surface, impact at the ground surface,vibration at depth, impact at depth. Introduction, preloading, sand drains, sand wicks, band drains, stone and lime columns.

UNIT III Mechanical Stabilization

Soil aggregate mixtures, properties and proportioning techniques, soft aggregate stabilization, compaction, field compaction control.

Cement Stabilization Mechanism, factors affecting and properties, use of additives, design of soilcement mixtures, construction techniques.

Lime and Bituminous Stabilization Type of admixtures, mechanism, factors affecting, design of mixtures,construction methods.

UNIT IV Reinforced earth

Principles, components of reinforced earth, governing design of reinforced earth walls, design principles of reinforced earth walls.

UNIT V Geotextiles

Introduction, types of geotextiles, functions and their applications, tests for geotextiles, geogrids and its functions.

Text Books :

1. Hausmann M.R(1990) Engineering Principles of ground modification, McGraw-Hill International edition.

2. Ground improvement Techniques, P.Purushothama Raju, Laxmi Publications Pvt. Ltd., New Delhi.

3. Robert M. Koerner, Designing with Geosynthatics, Prentice Hall New Jercy, USA.

4. Construction and Geotechnical methods in Foundation Engineering, R.M.Koerner, McGraw-Hill Book Company.

5. Current Practices in Geotechnical Engineering Vol.-I, Alam Singh and Joshi, International Book Traders, New Delhi.

Intelligent Transportation system (MTCETE104C)

UNIT 1: Introduction of Travel Management : System Architecture, Standards, Database – Tracking Database – Commercial Vehicle Operations – Intelligent Vehicle Initiative - Metropolitan ITS – Rural ITS – ITS for Rail network.

UNIT 2: ITS Designs ITS Designs: Modelling and Simulation Techniques - Peer – to – Peer Program – ITS for Road Network – System Design – Mobile Navigation Assistant – Traffic Information Center – Public Safety Program.

UNIT 3: Automated Highway Systems

Automated Highway Systems: Evolution of AHS and Current Vehicle Trends - Vehicles in

Platoons – Aerodynamic Benefits - Integration of Automated Highway Systems – System

Configurations - Step by Step to an Automated Highway System.

UNIT 4: Spacing and Capacity for Different AHS Concepts

Spacing and Capacity for Different AHS Concepts – Communication Technologies for

AHS - The Effects of AHS on the Environment – Regional Mobility - Impact Assessment of

Highway Automation.

UNIT 5: ITS Travel Management: Autonomous Route Guidance System – Infrastructure based systems – Telecommunications – Vehicle – Road side communication – Vehicle Positioning System – Electronic Toll Collection – Electronic Car Parking

References:

1. ITS Hand Book 2000: Recommendations for World Road Association (PIARC) by

Kan Paul Chen, John Miles.

2. Roger R. Stough, “Intelligent Transport Systems – Cases and Policies”, Publisher:

Edward Elgar, 2001.

3. Chris Drane and Chris Rizos, “Positioning Systems in Intelligent Transportation

Systems", Artech House Publishers, London

4. Joseph M. Sussman, "Perspectives on Intelligent Transport Systems", Springer

Publishers.

Ground Improvement Techniques Lab (MTCETE105)

1. To determine shear strength parameters of the given soil sample by Direct Shear Test.

2. To find the shear of the soil by Undrained Triaxial Test.

3. To determine the settlements due to primary consolidation of soil by conducting one dimensional test

.

4. Wetting And Drying, And Freezing And Thawing Tests For Compacted Soil-Cement Mixtures.

5. Determination Of Lime Content Of Lime Stabilized Soils.

6. Standard Test Method For Determining Short-Term Compression Behavior of Geosynthetics.

7.To determine the liquid limit of a given soil sample.

8. To determine the plastic limit of a given soil sample.

9. To determine the plasticity index of a given soil sample.

10. Visual classification of soil.

SEMESTER II								
THEORY PAPERS					**Marks Allocation**			
Code	**Subject/Paper**	**L**	**P**	**T**	**IA**	**EA**	**Total**	**Credits**
MTCETE201	Traffic Engineering II	3	0	1	50	100	150	4
MTCETE202	Urban Transportation Planning I	3	0	1	50	100	150	4
MTCETE203	Highway Geometric Design	3	0	1	50	100	150	4
Electives (Any One)								
MTCETE204A	Bridge Engineering	3	0	1	50	100	150	4
MTCETE204B	Transportation Planning	3	0	1	50	100	150	4
MTCETE204C	Highway Construction	3	0	1	50	100	150	4
PRACTICALS/VIVA VOCE								
MTCETE205	Highway Material Testing Lab	0	2	0	60	40	100	1
	TOTAL	12	2	4	260	440	700	17

Traffic Engineering II (MTCETE201)

UNIT 1: Traffic Forecast: General travel forecasting principles, different methods of traffic

forecast - Mechanical and analytical methods, Demand relationships, methods for future projection.

.**UNIT 2: Highway Capacity and Accident Analysis**

Highway Capacity: Factors affecting capacity, level of service; Capacity studies - Capacity of different highway facilities including unsignalised and signalized intersections. Problems in Mixed Traffic flow; Case studies.

Accident Analysis: Analysis of individual accidents and statistical data; Methods of representing accident rate; Factors in traffic accidents; influence of roadway and traffic conditions on traffic safety; accident coefficients; Driver strains due to roadway and traffic conditions.

UNIT 3: Traffic Flow Theory and Probabilistic Aspects of Traffic Flow

Traffic Flow Theory: Fundamental flow relationship and their applications, Traffic flow theories and applications; Shock waves; Queuing theory and applications.

Probabilistic Aspects of Traffic Flow: Vehicle arrivals, distribution models, gaps and headway distribution models; gap acceptance merging parameters, delay models, applications.

UNIT 4: Simulation

Simulation: Fundamental principle, application of simulation techniques in traffic engineering, general simulation process, formulation of simulation models, physical, analog and symbolic models, measure of effectiveness, analytical, numerical and Monte Carlo techniques, representation and scanning, physical and memorandum, comparison, applications.

UNIT 5: Design Hourly Volume for Varying Demand Conditions: Concept of Design vehicle units and determination of PCU under mixed traffic conditions, Price-volume relationships, demand functions. Determination of design hourly volume; critical hour concept.

References:

1 Babkov, V.F. “Road conditions and Traffic Safety”, MIR publications, - 1975.

2 Kadiyali, L.R., “Traffic Engineering and Transport Planning”, Khanna Publications.

3 Drew, D.R., “Traffic Flow Theory and Control”, McGraw Hill Book Co.

4 Wohl and Martin, “Traffic Systems Analysis for Engineers and Planners”, McGraw Hill Book Co.

5 Pignataro, Louis, “Traffic Engineering - Theory and Practice”, John Wiley.

6 Barenbag, `Traffic Flow Theory' – Monograph

Urban Transportation Planning I (MTCETE202)

UNIT 1: Urban Transportation Problems and Planning Process

Urban Transportation Problems and Planning Process: Role of transportation and change in concerns of society in transportation planning; Transportation problems and problem domain; objectives and constraints; flow chart for transportation planning process, inventory, model building, forecasting and evaluation stages

UNIT 2: Data Collections and inventories

Data Collections and inventories: Definition of study area; zoning, types and sources of data, methods of O-D Survey- passenger, goods; sampling techniques, expansion factors, accuracy checks; use of secondary data. Sufficiency and deficiency studies by screen lines

UNIT 3: UTPS Approach

UTPS Approach: Trip Generation- Zonal models, category analysis, household models, trip attraction of work centres and commercial trips, Trip Distribution-Growth factor models, Gravity models and opportunity models. Model split analysis- Mode choice behaviour, competing models, mode split models, probabilistic and two stage mode split analysis. Route split analysis- traffic assignment, basic elements of transportation networks, coding, diversion curves, minimum path trees, all- ornothing assignments, capacity restraint techniques

UNIT 4: Landuse and its interaction

Landuse and its interaction: Lowry derivative models - Quick response techniques - Non-Transport solutions for transport problems. Ekistics - Science of human settlements - Characteristics of urban structure. Town planning concepts - Neighbourhood planning.

UNIT 5: Transit Networks and System Analysis: Transit networks – types and their characteristics; transfers in transit networks; system analysis in transit – conceptual models, modeling procedures; terminal or station location planning – issues, objectives, station spacing decisions.

Reference:

1. Hutchinson B G (1974), "Principles of urban transportation system planning", McGraw Hill

2. Bruton M J (1981), "Introduction to transportation planning", Hutchinson of London

3. Dickey J W(1980), "Metropolitan Transportation Planning", Tata McGraw Hill

4. Michael D Mayer and Eric J Miller(1974), "Urban transportation planning A Decision Oriented Approach", McGraw Hill.

5. C. S. Papacostas and P.D. Prevedouros (2002), "Transportation Engineering and Planning", Prentice Hall.

Highway Geometric Design (MTCETE203)

UNIT 1: Design Elements-I

Design Elements: Objectives and requirements of highway geometric design, highway classification, terrain classification, importance of traffic data in geometric design, design hour volume, directional distribution of traffic, traffic composition, traffic forecasting, design vehicle, design speed, highway capacity, level of service.

UNIT 2: Design Elements-II

Design Elements: Sight distances - types, analysis, factors affecting, measurements, Horizontal alignment - design considerations, stability at curves, super elevation, widening, transition curves; curvature at intersections, vertical alignment - grades, ramps, design of summit and valley curves, combination of vertical and horizontal alignment including design of hair pin bends, design of expressways, IRC standards and guidelines for design problems.

UNIT 3: Cross Section Elements

Cross Section Elements: Right of way and width considerations, roadway, shoulders, kerbs, camber, side slope, lateral and vertical clearance, control of access, traffic barriers, medians, frontage roads; Pavement surface characteristics - types, cross slope, skid resistance, unevenness.

UNIT 4: Design of Intersections

Design of Intersections: Characteristics and design considerations of at-grade intersections; Different types of islands, channelization; median openings; design of rotary intersections; Grade separations and interchanges - types, warrants, adaptability and design details; Interchanges - different types, ramps.

UNIT 5: Design of Parking lots

Design of Parking lots - Factors, design elements, different types of parking, design of ramps and other elements of multistoried parking lots.

References:

1. AASHTO, A Policy on Geometric Design of Highways and Streets', American Association of State Highway and Transportation Officials, Washington D.C.

2. Khanna S.K. and Justo, C.E.G., Highway Engineering', Nem Chand and Bros.

3. DSIR, Roads in Urban Areas', HMSO, London.

4. Jack E Leish and Associates, Planning and Design Guide: At-Grade Intersections. Illinios.

5. IRC: 86-1983, IRC: 52- 1973, IRC: 64-1990, IRC: 3-1984, IRC: 38-1988, IRC:66-1976, IRC: 65-1976, IRC: 92-1985, IRC: 103-1988, IRC SP: 41

6. Kadiyali, L.R., Principles & Practice of Highway Engineering, Khanna Publishers,2003

7. Kadiyali, L.R. Traffic Engineering and Transport Planning, Khanna Publishers.

Bridge Engineering (MTCETE204A)

UNIT 1: History of Bridge Development

History of Bridge Development: Classification of bridges, Selection of bridge sites, Bridge alignment, Sub-surface investigations, Bridge Hydrology, Flood discharge, waterways, scour depth, depth of foundation, standards of loadings, types of loads, impact effect, wind loads, seismic forces, buoyancy, earth pressure, loadings on various bridges, traffic requirements, types of low cost bridges.

UNIT 2: Bridge Super structure

Bridge Super structure: Superstructure elements, Bridge flooring, design of slab bridges & girder bridges, Bridge bearings, joins in bridges, bridge superstructures.\

UNIT 3: Bridge Foundation

Bridge Foundation: Settlements, Allowable soil pressures, types of foundations, foundation failures, foundation setting, piers, abutments, wing walls and approaches, and cofferdams.

UNIT 4: Bridge Construction

Bridge Construction: Erection of steel girder bridges, truss bridges, suspension bridges, maintenance of bridges, bridge testing for safe carrying capacity, strengthening of bridges, aesthetical treatments.

UNIT 5: Standard specifications for Bridges – IRC loadings for road bridges – standards for railway bridges – design of RC slab, skew slab and box culverts. Design of T beam bridges – balanced cantilever bridges – rigid frame bridges – Arch bridges – bow string girder bridges, fly overs.

References:

1. Ponnuswamy, S., “Bridge Engineering”, Tata McGraw - Hill, New Delhi,

1997

2. Victor, D.J., “Essentials of Bridge Engineering”, Oxford & IBH Publishers

Co., New Delhi, 1980.

3. Bindra S.P., “Bridge Engineering”, Dhanpat Rai & Sons

4. Relevant IRC codes,

5. MORT&H Specifications & Standards for Roads & Bridges

Transportation Planning (MTCETE204B)

UNIT1: Introduction to transportation planning: Fields of transportation Engineering; System-Environment Ensemble; Transportation planning process; Transportation problems and problem solving process.

UNIT2: Transportation data and survey methods: Type of Transportation data and its sources, Data quantity and quality, Accuracy and Precision, Sampling techniques, sample sizes, Transportation Planning surveys – Documentation searches, Person surveys, Household surveys, In-transit surveys, Road-side surveys, etc.

UNIT 3: Transportation Modes and Technologies: Technologies of Transport and System Components, Network Analysis; Minimum Path Algorithms, Path Characteristics, Path-Vehicle Interaction – Discrete Flows and Continuous Flows, Vehicle and its Performance, System Performance, Vehicle and Container, Weight to Volume relation, Terminal Planning, Operational Planning

UNIT 4: Four-stage Sequential Planning: Urban transportation planning process; trip generation, correlation analysis and regression analysis; trip distribution, Growth factor methods and Synthetic methods; modal split models, first generation, second generation, behavioural models; minimum travel path computations; Trip assignments, route assignment, multiple assignment and network assignment.

UNIT 5: Land use–Transportation Planning: Urban Forms, mobility and activity hierarchy; accessibility-based early-era models; Lowery's model and its derivatives; Modern era models.

Suggested Books:

1 B. G. Hutchinson, "Principles of Urban Transport Systems Planning"

Scripta Book Co., Washington 1974

2 Anthony J. Richardson, Elizabeth S. Ampt and Arnim H. Meyburg,

"Survey Methods for Transport Planning" Eucalyptus Press, Australia. 1995

3 Roy Thomas, "Traffic Assignment Techniques", Avebury Technical,

Aldershot, England 1991

4 C A O'Flaherty, ed , "Transport Planning and Traffic Engineering",

Butterworth Heinemann, Elsevier, Burlington, MA 2006

5 C Jotin Khisty and B Kent Lall, "Transportation Engineering – An

Introduction", Prentice Hall of India Pvt Ltd., New Delhi 2003.

Highway Construction (MTCETE204C)

UNIT 1: Equipment in Highway Construction and Sub grade

Equipment in Highway Construction: Various types of equipment for excavation, grading and

compaction - their working principle, advantages and limitations. Special equipment for bituminous and cement concrete pavement, stabilised soil road construction. Subgrade: Earthwork grading, compaction and construction of embankments and cuts for roads, problems in embankment construction on weak and compressible foundation, Preparation of subgrade, quality control tests as per MoRTH specifications

UNIT 2: Flexible Pavements Layers

Flexible Pavements: Specifications of materials, construction method and field control checks for various types of flexible pavement materials in sub-base, base, binder and surface course layers and their choice.

UNIT 3: Cement Concrete Pavement Layers

Cement Concrete Pavement Layers: Specifications and method of cement concrete pavement

construction; Compaction of interlocking block pavements, Quality control tests; Construction of

various types of joints.

UNIT 4: Soil Stabilized Pavement Layers and drainage

Soil Stabilized Pavement Layers: Principles of gradation/proportioning of soil-aggregate mixes and compaction; Design factors, mix design, construction control and quality control checks for mechanical, soil-cement, soil-bitumen and soil-lime stabilization methods. Use of additives,

Numerical problems on mix design and application of Rothfutch method. Drainage: Design and construction of surface and sub-surface drainage system for highways and airports. Drainage materials, design procedures and IRC Guidelines for Drainage of Urban Roads.

UNIT 5: Maintenance and Hill Roads

Maintenance: Methods of Maintenance of different types of pavements; Special problems in highrainfall areas and wet /water logging condition, maintenance of drainage system.Hill Roads: Special problems in construction and maintenance of hill roads; land slides, causes, investigation and remedial measures, protection of embankment and cut slopes, Numerical problems on slope stability.

References:

1. Peurifoy, R.L., “Construction, Planning, Equipment and Method” - McGraw Hill Book Co.

2. DSIR - Soil Mechanics for Road Engineers', HMSO - London

3. DSIR - Bituminous Materials in Road Construction', HMSO London

4. DSIR - Concrete Roads, Design and Construction', HMSO London

5. Leonards, G.A., Foundation Engineering', McGraw Hill Book Co.

6. Cedergren, H.R., “Drainage of Highway and Airfield Pavements”, John Wiley and Sons.

7. Woods, K.B., Berry D.S. and Goetz, W.H., “Highway Engineering Hand Book”, McGraw Hill Book Co.

8. Relevant IRC standards.

Highway Material Testing Lab (MTCETE205)

1. Aggregate impact test.
2. Aggregate crushing value test.
3. Loss angels abrasion testing machine.
4. To determine elongation index and flakiness index for a given sample of aggregate.
5. To determine flakiness index for a given sample of aggregate.
6. To determine fineness modulus of a given sample of coarse aggregate.
7. Marshall stability test.
8. Ductility test on bitumen.
9. Softening test of bitumen.
10. Standard tar viscometer test.

THIRD SEMESTER								
THEORY PAPERS					**Marks Allocation**			
Code	**Subject/Paper**	**L**	**P**	**T**	**IA**	**EA**	**Total**	**Credits**
MCETE301	Pavement Management System	3	0	1	50	100	150	4
MCETE302	Urban Transportation Planning II	3	0	1	50	100	150	4
MCETE303	Traffic Flow Theory	3	0	1	50	100	150	4
Electives (Any One)								
MCETE304A	GIS Application in Transportation Engineering	3	0	1	50	100	150	4
MCETE304B	Transportation Facility Design	3	0	1	50	100	150	4
MCETE304C	Intelligent Transport System	3	0	1	50	100	150	4
PRACTICALS/VIVA VOCE								
MTCETE305	Seminar	0	0	0	60	40	100	2
	TOTAL	12	0	4	260	440	700	18

Pavement Management System (MTCETE301)

UNIT 1: Introduction and Ranking and Optimisation Methodologies

Introduction: Components of pavement management systems, pavement maintenance measures, planning investment, research management.

Ranking and Optimisation Methodologies: Recent developments, sample size selection, economic optimisation of pavement maintenance and rehabilitation.

UNIT 2: Pavement Performance Prediction

Pavement Performance Prediction: Concepts, modelling techniques, structural condition deterioration models, mechanistic and empirical models, HDM and other models, comparison of different deterioration models. Functional condition deterioration models, unevenness prediction models and other models, comparison. Modelling in rehabilitation budget planning, case studies.

UNIT 3: Design Alternatives and Selection

Design Alternatives and Selection: design objectives and constraints, basic structural response models, physical design inputs, alternate pavement design strategies and economic evaluation, Reliability concepts in pavement engineering, life cycle costing, analysis of alternate pavement strategies based on distress and performance, case studies.Road Asset Management, Pavement Preservation Programmes, Techniques and Tools

UNIT 4: Expert Systems and Pavement Management

Expert Systems and Pavement Management: Role of computers in pavement management, applications of expert systems for managing pavements, expert system for pavement evaluation and rehabilitation, knowledge-based expert systems, case studies. Implementation of pavement management systems.

UNIT 5: Types of Distress: Structural and functional, serviceability, fatigue cracking, pavement deformation and behaviour in flexible and rigid pavements. Low temperature shrinkage cracking., Factors affecting performance, relation between performance and distress.

References:

1. Ralph Haas and Ronald W. Hudson, "Pavement Management System",

McGraw Hill Book Co. 1978

2. Ralph Haas , Ronald Hudson and Zanieswki , "Modern Pavement

Management", Kreiger Publications

3. OECD, Pavement Management Systems, O E C D 1987.

4. Shahin M. Y., "Pavement Management for Airport, Roads and Parking Lots",

Chapman and Hall, 1994.

5. Susan Brown, Pavement Management Systems, Transportation Research Board, 1993.

Urban Transportation Planning II (MTCETE302)

UNIT 1: Land use Activities and Spatial standards

Land use Activities: Analysis and prediction of important land use activities like population, employment, housing, shopping, leisure, transport.

Spatial standards: Spatial standards for residential, industrial, commercial and recreational areas, space standards for facility areas and utilities, Process of implementation, Provisions of Town Planning Act, zoning, subdivision practice, metro region concept.

UNIT 2: Techniques of Preparation of Base Maps: Drawing size, scale, format, orientation, reduction and enlargement of base maps.

UNIT 3: Urban Renewal

Urban Renewal: Meaning, significance, scope and limitations, urban renewal as a part of metropolitan plan, the process of urban renewal, identification of renewal areas, renewal policies and strategies and management of renewal areas, central areas and their renewal.

UNIT 4: Concept of New Towns

Concept of New Towns: Meaning, role and functions: Special planning and development considerations, scope and limitations of new town development, Indian and British experience of planning and development of new towns. Recent Trends & Practices: In planning and development system in India, Outline of planning and development system in U.K., U.S.A. and U.S.S.R..

UNIT 5: Techniques of Preparation of Town Development Plan: Scope, contents and preparation. A case study of development plan, scope, content and preparation of zonal development plans, plan implementation - organizational legal and financial aspects, public participation in plan formulation and implementation.

References:

1. Margaret Roberts, "Town Planning Techniques", Hutchinson Educational Publication.

2. Modak N.V., Ambedkar V.N., "Town and Country Planning and Housing",

3. C. S. Papacostas and P.D. Prevedouros (2000), "Transportation Engineering and Planning", Prentice Hall

4. Gupta R.G., Planning and Development of Towns, New Delhi.

5. Ramegauda K.S., "Urban and Regional Planning", Mysore University Publication.

Traffic Flow Theory (MTCETE303)

UNIT 1: Traffic stream characteristics and Description using distributions: Measurement, Microscopic and Macroscopic study of Traffic Stream Characteristics Goodness of Fit Tests - Flow, speed and

concentration; Use of counting, Interval and Translated Distributions for describing Vehicle Arrivals, Headways, Speeds, Gaps and Lags; Fitting of Distributions

UNIT 2: Traffic Stream Models : Fundamental Equation of Traffic flow, Speed-Flow- Concentration Relationships, Normalised relationships, Fluid Flow Analogy Approach, shock Wave Theory, Platoon Diffusion and Boltzman like Behaviour of Traffic Flow, Car-Following Theory, Linear and Non linear Car Following Models, Acceleration Noise

UNIT 3: Queuing Analysis Queuing Analysis : Fundamentals of Queuing Theory, Demand Service Characteristics, Deterministic Queuing Models, Stochastic Queuing Models, Multiple Service Channels, Models of Delay at Intersections and Pedestrian Crossings

UNIT 4: Highway Capacity and Level- of – Service Studies Highway Capacity and Level- of – Service Studies: Concepts, Factors affecting Capacity and Level of Service, Capacity Analysis of Different Highway Facilities, Passenger Car Units, Problems in Mixed Traffic Flow

UNIT 5 : Simulation Models Simulation Models : Philosophy of Simulation Modelling, Formulation of Simulation Model, Methodology of System Simulation, Simulation Languages, Generation of Random Numbers, Generation of Inputs-Vehicle Arrivals, Vehicle Characteristics, Road Geometrics, Design of computer Simulation Experiments, Analysis of Simulation Data, Formulation of Simulation Problems in Traffic Engineering and Validation.

References:

1. TRB-SR No.165-Traffic Flow Theory, Transportation Research Board, Washington-D.C.

2. May, A.D, Traffic Flow Fundamentals, Prentice-Hall, NJ

3. Drew D.R, Traffic Flow Theory and Control, McGraw-Hill, New York.

4. TRB Special Report 209: Highway Capacity Manual, Transportation Research Board, Washington DC,1985.

5. Wohl M. and Martin, B.V., “Traffic System Analysis for Engineers and Planners”, McGraw-Hill, New York.

6. McShane W R & Roess R P, “Traffic Engineering”, Prentice-Hall, NJ

7. Mannering F.L & Kilareski, W.P., “Principles of Highway Engineering and

Traffic Analysis”, John Wiley & Sons.

8. Neylor, T. H et al., “Computer Simulation Techniques”, John Wiley

GIS Application in Transportation Engineering (MTCETE304A)

UNIT :1. **Introduction: Definitions of GIS** – Components of GIS – Geographic data presentation: maps – mapping process – coordinate systems – transformations – map projections – geo referencing - data acquisition.

UNIT :2. Geographic Data Representation, Storage, Quality and Standards: Storage – Digital representation of data – Data structures and database management systems – Raster data representation – Vector data representation – Concepts and definitions of data quality – Components of data quality – Assessment of data quality – Managing data errors – Geographic data standards.

UNIT :3. **GIS Data Processing, Analysis and Modeling**: Raster based GIS data processing – Vector based GIS data processing – Queries – Spatial analysis – Descriptive statistics – Spatial autocorrelation – Quadrant counts and nearest neighbour analysis – Network analysis – Surface modeling – DTM.

UNIT :4. **GIS Applications**: Applications of GIS in Environment monitoring – Natural hazard management, Transport Planning, Analysis and monitoring. Use of softwares related to GIS applications in Transportation Engineering.

UNIT :5. Structure of GIS: Cartography, Geographic mapping process, transformations, map projections, Geographic Data Representation, Storage, Quality and Standards, database management systems, Raster data representation, Vector data representation, Assessment of data quality, Managing data errors, Geographic data standards.

Suggested Books:

1. Lo, C.P. & Yeung A.K.W., Concepts and Techniques of Geographic Information Systems, Prentice Hall of India, New Delhi, 2006.

2. Anji Reddy, M., Remote Sensing and Geographical Information Systems, B.S.Publications, Hyderabad, 2001.

3. Burrough, P.A., Principles of Geographical Information Systems, Oxford Publication, 1998.

4. Clarke, K., Getting Started with Geographic Information Systems, Prentice Hall, New Jersy, 2010.

5. DeMers, M.N., Fundamentals of Geographic Information Systems, John Wiley & Sons, New York, 2002.

6. Geo Information Systems – Applications of GIS and Related Spatial Information Technologies, ASTER Publication Co., Chestern (England), 1992

Transportation Facility Design (MTCETE304B)

UNIT 1: Introduction

Introduction: Design of highways, design of at-grade intersections, design of signalized intersection, design of grade separated intersection, terminal design, and design of facilities for non-motorised transport.

UNIT 2: Terminal Planning & Design Terminal Planning & Design: Terminal functions, analysis of terminals, process flow charts of passenger & goods terminals, terminal processing time, waiting time, capacity & level of service concept, study of typical facilities of highway, transit, airport and waterway terminals, concept of inland port.

UNIT 3: Design of Highways

Design of Highways: Hierarchy of highway system, functions, design designations, concepts in horizontal & vertical alignment, integration, optical design, geometrical standards for mobility & accessibility components, landscaping and safety considerations, evaluation and design of existing geometrics.

UNIT 4: Design of IntersectionsS

Design of Intersections: Review of design of at-grade intersections, signal coordination – graphic methods & computer techniques, grade separated intersections – warrants for selection, different types & geometric standards, spacing & space controls, ramps & gore area design.

UNIT 5: Energy Issues in Transportation: Energy consumption, alternate transportation fuels, energy conservation, energy contingency strategies, energy analysis information and methods, Transportation alternatives.

References:

1. Kadiyali, L.R., "Traffic Engineering and Transport Planning", Khanna Publishers.

2. IRC-SP41: Guidelines for the Design of At-Grade Intersections in Rural & Urban Areas

3. Salter, R J., Highway Traffic Analysis and Design, ELBS.

4. Edward K. Morlock, "Introduction to Transportation Engineering & Planning,

International Student Edition", Mc-Graw Hill Book Company, New York.

INTELLIGENT TRANSPORT SYSTEMS (MTCETE304C)

UNIT-I

Fundamentals of ITS:Definition of ITS, the historical context of ITS from both public policy and market economic perspectives, Types of ITS; Historical Background, Benefits of ITS.

UNIT-2.

Sensor technologies and Data requirements of ITS: Importance of telecommunications in the ITS. Information Management, Traffic Management Centers (TMC). Application of sensors to Traffic management; Traffic flow sensor technologies;Transponders and Communication systems; Data fusion at traffic management centers; Sensor plan and specification requirements; Elements of Vehicle Location and Route Navigation and Guidance concepts; ITS Data collection techniques –Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), GIS, video data collection.

UNIT-3.

TS User Needs and ServicesandFunctional areas–Introduction, Advanced Traffic Management systems (ATMS), Advanced Traveler Information systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control systems (AVCS), Advanced Public Transportation systems (APTS), Advanced Rural Transportation systems (ARTS).

UNIT-4.

ITS Architecture –Regional and Project ITS architecture; Concept of operations; ITS Models and Evaluation Methods; Planning and human factor issues for ITS, Case studies on deployment planning and system design and operation;

ITS and safety, ITS and security, ITS as a technology deployment program, research, development and business models, ITS planning.

UNIT-5.

TS applications:Traffic and incident management systems; ITS and sustainable mobility, travel demand management, electronic toll collection, ITS and road-pricing.; Transportation network operations; commercial vehicle operations and intermodal freight; public transportation applications; ITS and regional strategic transportation planning, including regional architectures: ITS and changing transportation institutions Automated Highway Systems-Vehicles inPlatoons

–Integration of Automated Highway Systems. ITS Programs in the World –Overview of ITS implementations in developed countries, ITS in developing countries.

References:

1. Fundamentals of intelligent transportation systems planning By Mashrur A. Chowdhury, Adel Wadid Sadek

2. Lawrence A. Klein , Sensor technologies and Data requirements of ITS

3. ITS Hand Book 2000: Recommendations for World Road Association (PIARC) by Kan Paul Chen, John Miles.

4. Sussman, J. M., Perspective on ITS, Artech House Publishers, 2005.

5. National ITS Architecture Documentation, US Department of Transportation, 2007 .

Seminar (MTCETE305)

SEMESTER IV								
THEORY PAPERS					**Marks Allocation**			**Credits**
Code	**Subject/Paper**	**L**	**T**	**P**	**IA**	**EA**	**Total**	
MTCETE401	Dissertation	0	0	0	300	400	700	12
	TOTAL				300	400	700	12

Note-:

The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format, thereafter he/she will have to present the progress of the work through seminars and progress reports. Seminar related to the project should be delivered one after starting of semester .The progress will be monitored through seminars and progress reports.

- **The Total Number of credits of the M-Tech(Civil Engineering) program=64.**
- **The award of the degree a student shall be required to earn the minimum of 60 credits.**

Dissertation (MTCETE401)

FACULTY OF ENGINEERING & TECHNOLOGY

M.Tech Program in Civil Engineering with Specialization in

(STRUCTURE ENGINEERING)

SEMESTER I

THEORY PAPERS					**Marks Allocation**			
Code	**Subject/Paper**	**L**	**P**	**T**	**IA**	**EA**	**Total**	**Credits**
MTCESE101	Theory Of Elasticity And Plasticity	3	0	1	50	100	150	4
MTCESE102	Aseismic Design	3	0	1	50	100	150	4
MTCESE103	Prestressed Concrete	3	0	1	50	100	150	4
Electives (Any One)								
MTCESE104A	Statistical and Mathematical Techniques	3	0	1	50	100	150	4
MTCESE104B	Ground Improvement Techniques	3	0	1	50	100	150	4
MTCESE104C	Structural Dynamics	3	0	1	50	100	150	4
PRACTICALS/VIVA VOCE								
MTCESE105	Ground Improvement Techniques Lab	0	2	0	60	40	100	1
	TOTAL	12	2	4	260	440	700	17

SEMESTER II								
THEORY PAPERS					**Marks Allocation**			
Code	**Subject/Paper**	**L**	**P**	**T**	**IA**	**EA**	**Total**	**Credits**
MTCESE201	Advanced Concrete Design	3	0	1	50	100	150	4
MTCESE202	Advanced Steel Structures	3	0	1	50	100	150	4
MTCESE203	Design Of Bridges	3	0	1	50	100	150	4
Electives (Any One)								
MTCESE204A	Maintenance And Rehabilitation Of Structures	3	0	1	50	100	150	4
MTCESE204B	Advanced Theory Of Concrete Structures	3	0	1	50	100	150	4
MTCESE204C	Design Of Substructures	3	0	1	50	100	150	4
PRACTICALS/VIVA VOCE								
MTCESE205	Non-destructive testing Lab	0	2	0	60	40	100	1
	TOTAL	12	2	4	260	440	700	17

THIRD SEMESTER								
THEORY PAPERS					**Marks Allocation**			
Code	**Subject/Paper**	**L**	**P**	**T**	**IA**	**EA**	**Total**	**Credits**
MTCESE301	Disaster Mitigation And Management	3	0	1	50	100	150	4
MTCESE302	Construction Techniques And Management	3	0	1	50	100	150	4
MTCESE303	Advanced Concrete Technology	3	0	1	50	100	150	4
Electives (Any One)								

MTCESE304A	High Rise Structures	3	0	1	50	100	150	4
MTCESE304B	Theory Of Plates And Shells	3	0	1	50	100	150	4
MTCESE304C	Advanced Foundation Engineering	3	0	1	50	100	150	4
PRACTICALS/VIVA VOCE								
MTCESE305	Seminar	0	0	0	60	40	100	2
	TOTAL	12	0	4	260	440	700	18

SEMESTER IV								
THEORY PAPERS					**Marks Allocation**			**Credits**
Code	**Subject/Paper**	**L**	**T**	**P**	**IA**	**EA**	**Total**	
MTCESE401	Dissertation	0	0	0	300	400	700	12
	TOTAL				300	400	700	12

Note-:

The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format, thereafter he/she will have to present the progress of the work through seminars and progress reports. Seminar related to the project should be delivered one after starting of semester .The progress will be monitored through seminars and progress reports.

- **The Total Number of credits of the M-Tech(Civil Engineering) program=64.**
- **The award of the degree a student shall be required to earn the minimum of 60 credits.**

M.Tech. Program in Civil Engineering with Specialization in

(Structure Engineering)

Choice Based Credit System (CBCS)

SEMESTER I

THEORY PAPERS					**Marks Allocation**			
Code	**Subject/Paper**	**L**	**P**	**T**	**IA**	**EA**	**Total**	**Credits**
MTCESE101	Theory Of Elasticity And Plasticity	3	0	1	50	100	150	4
MTCESE102	Aseismic Design	3	0	1	50	100	150	4
MTCESE103	Prestressed Concrete	3	0	1	50	100	150	4
Electives (Any One)								
MTCESE104A	Statistical and Mathematical Techniques	3	0	1	50	100	150	4
MTCESE104B	Ground Improvement Techniques	3	0	1	50	100	150	4
MTCESE104C	Structural Dynamics	3	0	1	50	100	150	4
PRACTICALS/VIVA VOCE								
MTCESE105	Ground Improvement Techniques Lab	0	2	0	60	40	100	1
	TOTAL	12	2	4	260	440	700	17

THEORY OF ELASTICITY AND PLASTICITY (MTCESE101)

UNIT 1

ELASTICITY : Analysis of stress and strain, stress strain relationship. Generalized Hookes Law. Plane stress and plane strain.

UNIT 2

ELASTICITY SOLUTION : Two – dimensional problems in Cartesian and polar coordinates for simple problems.

UNIT 3

TORSION OF NON – CIRCULAR SECTION : Methods of analysis – membrane analogy – torsion of thin rectangular section and hollow thin walled sections.

UNIT 4

ENERGY METHODS : Principle of virtual work – energy theorem – Rayleigh Ritz methods – Finite Difference method.

UNIT 5

PLASTICITY: Physical assumption – criterion of yielding, yield surface, Flow rule (plastic stress strain relationship). Elastic plastic problems in bending – torsion and thick cylinder.

REFERENCES

1. Timoshenko, s. and goodier J.N. Theory of Elasticity, Mc Graw Hill Book
2. Sadhu Singh, Theory of Elasticity, Khanna Publishers , New Delhi 1988.
3. Verma, PDS,Theory of Elasticity , Vikas Publishing Pvt. Ltd. New Delhi 1997

ASEISMIC DESIGN (MTCESE102)

UNIT 1

ELEMENTS OF EARTHQUAKE ENGINEERING : Elements of Engineering Seismology – Causes of earthquakes, Seismic waves, magnitude and intensity – Performance of structures under past earthquakes, Lessons learnt from past earthquakes.

UNIT 2

SEISMIC BEHAVIOUR OF STRUCTURAL ELEMANTS : Behavior of RCC, steel, timber, Masonry and Prestressed Concrete elements under cyclic loading – Seismic behavior of Soil and liquefaction.

UNIT 3

SESMIC DESIGN PHILISOPHY AND CODAL PROVISIONS : Seismic design philosophy – Provisions of Seismic Code IS 1893:2002 (Part I)- Determination of earthquake forces Seismic coefficient and Response Spectrum methods- Structural Configuration – Design and Detailing of Frames and Shear Walls – Provisions of IS – 13920.

UNIT 4

NON ENGINEERED CONSTRUCTION : Design of Non Engineered construction – Seismic evaluation and strengthening of building – Design Provisions for Bridges and Dams.

UNIT 5

BASE ISOLATION TECHNIQUES : Concepts of base isolation and energy dissipation devices, Modern Concepts – Adaptive systems – Case Studies.

References:

1. Course Notes Design of Reinforced Concrete Buildings IIT Kanpur, June 1999.
2. Minoru Wakabayashi Design of Earthquake Resistant Buildings, Mc Graw Hill Book Company New York 1986

PRESTRESSED CONCRETE (MTCESE103)

UNIT 1

INTRODUCTION – THEORY AND BEHAVIOUR : Principles of Prestressing Types of prestressing systems – Materials – Systems and devices – Behavior of prestressed concrete elements – General concept of Prestress – Force transmitted by pretensioned and post tensioned systems – losses in prestress – analysis for Ultimate Strength – Comparison of codal

UNIT 2

DESIGN FOR FLEXURE : Concept of Limit State design –Limit state of Collapse and serviceability – Design using allowable stresses – Stress range approach – Lins approach – Magnels approacg.

UNIT 3

DESIGN FOR SHEAR, TORSION AND ANCHORAGE ZONE : Shear resistance in beams- Design for shear in rectangular and flanged beams – Behavior under torsion – Modes of failure – Design for torsion, shear and bending Anchorage Zone – analysis and design of pretension and post tensioned end blocks – IS code provisions – Comparison of other codes.

UNIT 4

STATICALLY INDETERMINATE STRUCTURES : Analysis of indeterminate structures – Continuous beam – Concept of concordance and linear transformations – Single storied rigid frames – Choice of cable profiles.

UNIT 5

PSC SPECIAL STRUCTURES: Concept of circular prestressing – Design of prestressed concrete pipes and cylindrical water tanks – Composite construction types, behavior, flexural stresses, longitudinal shear transfer, transverse shear – Compression members – Design of poles and piles – Partial pre stressing – Principles , analysis and design concepts.

References:

1. Prestressed Concrete by N.Rajagobalan, Norosa Publishing House 2002
2. Prestressed Concrete by N.Krishnaraju, Tata Mc Graw Hill 3rd Edition 1985
3. BIS 13431980 Code of Practice for Prestressed concrete.

APPLIED MATHEMATICS (MTCESE104A)

UNIT 1

TRANSFORM METHODS : Laplace transform methods for one-dimensional wave equation Displacements in a long string-longitudinal vibration of an elastic bar – Fourier transforms methods for one-dimensional heat conduction problems in infinite and semi infinite rod.

UNIT 2

ELLIPTIC EQUATIONS: Laplace equation – Properties of harmonic functions – Fourier transform methods for Laplace equation.

UNIT 3

CALCULUS OF VARIATIONS: Variation and its properties – Euler's equation – Functional dependant on first and higher order derivatives – Functional dependent on functions of several independent variables – some applications – Direct methods.

UNIT 4

PROBABILITY AND RANDOM VARIABLES: Probability Random variables Moments – Moment Generating Function Standard Distributions – Functions of random variables – Two dimensional random variables.

UNIT 5

ESTIMATION THEORY: Principals of least squares – Multiple and partial correlation and regression – Estimation of Parameters – Maximum Likelihood Estimates – Method of moments.

REFERENCES

1. Sankar Rao, Introduction to Partial Differential Equation, Prentice Hall of India New Delhi 1995
2. Sneddon I.N., Elements of Partial Differential Equations Mc Graw Hill 1986.
3. Gupta S.C. & Kapoor, V.K Fundamentals of Mathematical Statistics, Sultan Chand & Sons Reprint 1999.

GROUND IMPROVEMENT TECHNIQUES (MTCESE104B)

UNIT 1

Introduction : Need for engineered ground improvement, classification of ground modification techniques; suitability, feasibility and desirability of ground improvement technique; objectives of improving soil.

UNIT 2

In-situ densification methods in granular soils & Cohesive soils: Introduction, Vibration at the ground surface, impact at the ground surface, vibration at depth, impact at depth. Introduction, preloading, sand drains, sand wicks, band drains, stone and lime columns.

UNIT 3

Mechanical Stabilization: Soil aggregate mixtures, properties and proportioning techniques, soft aggregate stabilization, compaction, field compaction control.

Cement Stabilization: Mechanism, factors affecting and properties, use of additives, design of soil cement mixtures, construction techniques.

Lime and Bituminous Stabilization : Type of admixtures, mechanism, factors affecting, design of mixtures,construction methods.

UNIT 4

Reinforced earth: Principles, components of reinforced earth, governing design of reinforced earth walls, design principles of reinforced earth walls.

UNIT 5

Geotextiles : Introduction, types of geotextiles, functions and their applications, tests for geotextiles, geogrids and its functions.

Recommended Text Books :

1. Hausmann M.R(1990) Engineering Principles of ground modification, McGraw-Hill

International edition.

2. Ground improvement Techniques, P.Purushothama Raju, Laxmi Publications Pvt. Ltd.,

New Delhi.

3. Robert M. Koerner, Designing with Geosynthatics, Prentice Hall New Jercy, USA.

4. Construction and Geotechnical methods in Foundation Engineering, R.M.Koerner,

McGraw-Hill Book Company.

5. Current Practices in Geotechnical Engineering Vol.-I, Alam Singh and Joshi,

International Book Traders, New Delhi.

STRUCTURAL DYNAMICS (MTCESE104C)

UNIT 1

Introduction: Objectives − types of dynamic problems − degree of freedom - D' Alemberts Principle − principle of virtual displacement − Hamilton's principle.

UNIT 2

Single Degree of Freedom System : Undamped and damped free and forced vibrations −critical damping − over damping **–** under damping − logarithmic decrement .

UNIT 3

Response to harmonic loading , evaluation of damping, vibration isolation , transmissibility , response to periodic forces- vibration measuring equipments. Duhamel integral for undamped system- Response to impulsive loads.

UNIT 4

Multidegree Freedom Systems and Continuous systems : Natural modes − orthogonality conditions − modal Analysis − free and harmonic vibration − Free longitudinal vibration of bars − flexural vibration of beams with different end conditions − forced vibration.

UNIT 5

Approximate methods: Rayleigh's method ,Dunkerley's method , Stodola's method , Rayleigh ,Ritz method , Matrix method.

References:

1. Clough & Penzien, "Dynamics of Structures".

2. Meirovitch.L, "Elements of Vibration Analysis".

3. W.T. Thomson , "Vibration Theory and Applications".

4. M.Mukhopadhyay , "Vibrations, Dynamics & Structural systems".

5. Paz Mario, "Structural Dynamics–Theory and Computation".

6. Denhartog, "Mechanical vibrations".

7. Timoshenko, "Vibration Problems in Engineering".

8. Anil K Chopra, "Dynamics of structures", Pearson Education.

GROUND IMPROVEMENT TECHNIQUES LAB (MTCESE105)

List of Experiments :-

1. To determine shear strength parameters of the given soil sample by Direct Shear Test.

2. To find the shear of the soil by Undrained Triaxial Test.

3. To determine the settlements due to primary consolidation of soil by conducting one dimensional test .

4. Wetting And Drying, And Freezing And Thawing Tests For Compacted Soil- Cement Mixtures.

5. Determination Of Lime Content Of Lime Stabilized Soils.

6. Standard Test Method For Determining Short-Term Compression Behavior of Geosynthetics.

7.To determine the liquid limit of a given soil sample.

8. To determine the plastic limit of a given soil sample.

9. To determine the plasticity index of a given soil sample.

10. Visual classification of soil.

SEMESTER II								
THEORY PAPERS					**Marks Allocation**			
Code	**Subject/Paper**	**L**	**P**	**T**	**IA**	**EA**	**Total**	**Credits**
MTCESE201	Advanced Concrete Design	3	0	1	50	100	150	4
MTCESE202	Advanced Steel Structures	3	0	1	50	100	150	4
MTCESE203	Design Of Bridges	3	0	1	50	100	150	4
Electives (Any One)								
MTCESE204A	Maintenance And Rehabilitation Of Structures	3	0	1	50	100	150	4
MTCESE204B	Advanced Theory Of Concrete Structures	3	0	1	50	100	150	4
MTCESE204C	Design Of Substructures	3	0	1	50	100	150	4
PRACTICALS/VIVA VOCE								
MTCESE205	Non-destructive testing Lab	0	2	0	60	40	100	1
	TOTAL	12	2	4	260	440	700	17

ADVANCED CONCRETE DESIGN (MTCESE201)

UNIT 1

DESIGN OF BEAMS: Behavior of RCC beams under combined shear torsion and Bending –Modes of failures-Inter action effects-Analysis and design of beams circular in plan-Design for serviceability Limit states-calculation of deflections and crack width according to IS 456-2000

UNIT 2

DESIGN OF SLENDER COLUMNS : Behaviour of slender RCC Columns- Failure modes and interaction curves Additional Moment method-Comparison of codal provisions-calculation of design moments for braced and unbraced columns-Principles of Moment magnification method-design of slender columns.

UNIT 3

DESIGN OF SPECIAL RCC ELEMENTS: Design and detailing of concrete braced and unbraced wall according to BIS code-classification of shear walls, design and detailing of Corbels-Desing and detailing of Deep beams –Approximate analysis and design of Grid floors.

UNIT 4

DESIGN OF FLAT SLABS AND FLAT PLATES: Yield line theory of slabs – Hilerberg method of design of slabs-Design of Flat slabs and flat plates according to BIS method-Shear in Flat slabs and Flat plates.

UNIT 5

INELASTIC BEHAVIOUR OF CONCRETE BEAMS AND FRAMES: Inelastic behaviour of concrete beams-moment – rotation curves-moment redistribution-Bakers method of analysis and design-Design of cast-in-situ joints in frames. Detailing requirments for ductility, durability and fire resistance.

REFERENCES:

1. Varghese, P.C. "Advanced Reinforced concrete Design ", Pretice Hall of india, (2000).\
2. Shah V.h.. &karve S.R. "Limit state theory and Design of reinforced Concrete", Structures Publication. Pune (2003)
3. Krishna Raju, N, "Advanced Reinforced concrite Design", CBS publisher
4. Sinha. S.N , "Reinforced Concrete Design ", Tata- McGraw-Hill(1996)
5. Purushothaman, P, Reinforced concrete structural Elements: Behaviour analysis and design , tata McGraw-Hill (1986).

ADVANCED STEEL STRUCTURES (MTCESE202)

UNIT 1

ANALYSIS AND DESIGN OF INDUSTRIAL BUILDINGS: Review of loads on structures-dead, live wind and Seismic loads as per National standard-Analysis and Design of Industrial building and bents Sway and non-sway frames design of Purlins, lovuver rails, gable column and Gable wind girder-Analysis and design of Gable frames.

UNIT 2

BEHAVIOUR AND DESIGN OF CONNNECTIONS: Connection behavior-Design requirements of Bolted and welded connections-unstiffened and stiffened seat connections-framed connection-connections for force and moment transmission – tee stub and end plate connections stiffeners and other reinforcement – principles of semi rigid connections.

UNIT 3

ANALYSIS AND DESIGN OF COLD-FORMED STEEL STRUCTURES: Types of cross sections concepts of local buckling and Effective width – Design of compression and tension members-concepts of lateral bucking –Design of Beams, deflection of beams and design of beam webs- Combined stresses and connections – Empirical design of Z-purlins with lips and wall studs.

UNIT 4

ANALYSIS AND DESIGN OF SPECIAL STRUCTURES: Analysis and design of steel water tanks-cylindrical pressed steel tanks-design of supporting chimney (lined and unlined) and Guyed steel stacks-Stresses due to wind and earthquake forces-Design of foundation along with loads calculations-Guest factor Method.

UNIT 5

PLASTIC ANALYSIS OF STRUCTURES: Concepts of plastic design-introduction-shape factor-Moment redistribution –static, concepts and uniqueness theorems-combined mechanism-Analysis of single bay and two bay portal frames-methods of plastic moment distribution – Effects of axial force and shear force on plastic moments resisting connection-design of continuous beams.

REFERENCES:

1. Teaching resource for structural steel design , INSDAG, KOLKOTTA (2001)
2. S. Ramachandra, Design of steel Structures , Vol. II standard Publication, New delhi.
3. Arthur R. thamboli, “Steel design Hand Book-LFRD method” McGraw-Hill (1997)

4. BIS 800-2007, indian standard code of practice for general construction in steel
5. BIS 883-1970- Indian standard code of practice for design of structural timber in building

DESIGN OF BRIDGES (MTCESE203)

UNIT 1

INTRODUCTION: Classification, investigations and planning, choice of type, I.R.C. specification For road bridges, standard live loads, others forces acting on bridges, general Design consideration.

UNIT 2

SHORT SPAN BRIDGES: Load distribution theories , analysis and design of slab culverts, tee beam and Slab bridges

UNIT 3

LONG SPAN BRIDGES: Design principles of continuous bridges, box girder bridges, and balanced Cantilever bridges

UNIT 4

PRESTRESSED CONCRETE BRIDGES: Design of pre stressed concrete bridges – preliminary dimensions – flexural And tensional parameters – Clubroom's theory – distribution coefficient by exact Analysis – design of girder section - maximum and minimum prestressing Forces – eccentricity – live load and dead load shear forces – cable zone in Girder – check for stresses at various sections – check for diagonal tension, Diaphragms – End block – short term and long term deflection.

UNIT 5

DESIGN OF PLATE GIRGER BRIDGES: Design of plate girder bridges – loading standards – road and rail

REFERENCES:

1. Raina V.K "Concrete bridge practice" , TaTa McGraw Hill Publishing Company, New Delhi, 1991.
2. Krishnaraju, N., "Design of Bridges "Oxford and IBH Publishing Co.,Bombay Calcutta,New Delhi, 1998
3. Bakht, B. and Jaegar,L.G., "Bridges Analysis simplified",McGraw Hill,1985.
4. Ponnuswamy, s.,"Bridges Engineering", TaTa McGraw Hill, 1973.

MAINTENANCE AND REHABILITATION OF STRUCTURES (MTCESE204A)

UNIT 1

MAINTENANCE AND REPAIP STRATEGIES : Definitions: Maintenance, repair and rehabilitation, Facts of Maintenance, importance of Maintenance, Assessment procedure for evaluating a damaged structure, Various aspects of inspection, Destructive and non – destructive testing techniques.

UNIT 2

CAUSES FOR FAILURES: Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, Corrosion – Mechanism, causes, consequences and remedial measures, Effect of cover thickness and cracking on durability of concrete.

UNIT 3

MATERIALS FOR REPAIR: Special concretes and mortar, concrete chemicals, Epoxy, Special elements for accelerated strength gain, Expansive cement, Polymer concrete composites, Ferro cement, Fiber reinforced concrete, Fiber reinforced polymer composites, Methods of corrosion protection inhibitors, protective coating materials for rebar and concrete, corrosion resistant steel, cathodic protection, micro concrete.

UNIT 4

TECHNIQUES FOR REPAIR: Rust converters and polymer coating for rebars during repair, Repair mortar for cracks, Bonding agents, Epoxy injection, Guniting and Shotcrete, FRP and Ferro cement Jacketing, vacuum concreting, Bonding plates, Overlays, Protective coatings, Shoring and underpinning.

UNIT 5

CASE STUDIES: Repairs to overcome low member strength, Deflection, Cracking, Chemical attack, Damage due to wear, leakage, fire, marine exposure and corrosion. Engineered demolition techniques for dilapidated structures – case studies.

REFERENCES:

1. M.S. Shetty Concrete Technology- Theory and Practice S.Chand
2. Varghese P.C, "Design of Reinforced Concrete Structures", Prentice hall of India

ADVANCED THEORY OF CONCRETE STRUCTURES (MTCESE204B)

UNIT 1

The nature of concrete, stress–strain relationships of concrete, stress–strain relationships of reinforcing steel, stress block parameters. Failure criteria for concrete.

UNIT 2

Behaviour of concrete flexural members, general equations for calculation of moment capacities at ultimate limit state and at limit state of local damage, flexural rigidity, calculation of deflection, redistribution of moments, design examples.

UNIT 3

Axially loaded compression members, combined axial load and uniaxial bending. Interaction diagrams, combined axial load and biaxial bending, slender compression members, design example using I.S.456–2000.

UNIT 4

Shear cracking of ordinary reinforced concrete members, web reinforcement, design examples, shear in tapered beams. Development length of reinforcement, anchorage. Significance of Torsion, Torsional resistance of concrete beams, reinforcement for torsion, design examples using I.S. 456-2000.

UNIT 5

General principles of detailing of reinforcement, effective depth, design of main reinforcement, design of transverse reinforcement, conditions at loads and at supports.

References:

1. Varghese P.C, “Design of Reinforced Concrete Structures”, Prentice hall of India.

2. Krishnamurthy, K.T, Gharpure S.C. and A.B. Kulkarni – “Limit design of reinforced

concrete structures”, Khanna Publishers, 1985.

DESIGN OF SUBSTRUCTURES (MTCESE204C)

UNIT 1

SUB SURFACE EXPLORATION: Purpose , Programme and Procedures interpretation of bore logs, soil data and exploration reports.

UNIT 2

SHALLOW FOUNDATIONS: Types of foundation and their specific application – depth of foundation – bearing capacity and settlements estimates-structural design of isolated, strip, rectangular, trapezoidal and combined footings – strap-balanced footings-raft foundation-Approximate flexible method of raft design- Compensated foundation.

UNIT 3

DEEP FOUNDATIONS: Types of piles and their application-load capacity –settlements-group action-design of piles & pile caps-Lateral load capacity of piles.

UNIT 4

FOUNDATIONS FOR BRIDGES AND OTHER MISCELLANEOUS STRUCTURES : Drilled shaft foundation and caissons for bridges , Foundations for towers – Chimneys – Silos

UINT 5

MACHINE FOUNDATIONS: Types, General requirements and design criteria-General analysis of machine foundation-soil system-stiffness and damping parameters-Tests for design parameters-Guide lines for design of reciprocating engines, impacts types machines, rotary type machines, framed foundation.

References:

1. Nayak, N.V. "foundation Design manual for practicing engineers". Dhanpat rai and sons. 1982
2. Braja M. Das "Principles of Foundation Engineering " Thomson Asia (p) LTD.

Non-destructive testing Lab (MTCESE205) (MTCEBT205)

1. To study of destructive testing techniques.
2. To study of Non- destructive testing techniques.
3. To determine the quality of concrete by ultrasonic pluse velocity.
4. To determine the compressive strength of concrete by rebound hammer test.
5. To determine the corrosion of steel by half cell potential test.
6. To determine the in-situ compressive strength of concrete core by core drilling method.
7. To study about chemical effect on hardand concrete.
8. To study about fiber reinforced concrete.
9. Determine of cover on reinforcement bars.
10. To study of Repair techniques for concrete structure.

THIRD SEMESTER								
THEORY PAPERS					**Marks Allocation**			
Code	**Subject/Paper**	**L**	**P**	**T**	**IA**	**EA**	**Total**	**Credits**
MTCESE301	Disaster Mitigation And Management	3	0	1	50	100	150	4
MTCESE302	Construction Techniques And Management	3	0	1	50	100	150	4
MTCESE303	Advanced Concrete Technology	3	0	1	50	100	150	4
Electives (Any One)								
MTCESE304A	High Rise Structures	3	0	1	50	100	150	4
MTCESE304B	Theory Of Plates And Shells	3	0	1	50	100	150	4
MTCESE304C	Advanced Foundation Engineering	3	0	1	50	100	150	4
PRACTICALS/VIVA VOCE								
MTCESE305	Seminar	0	0	0	60	40	100	2
	TOTAL	12	0	4	260	440	700	18

DISASTER MITIGATION AND MANAGEMENT (MTCESE301)

UNIT 1

ENVIRONMENTAL HAZARDS & DISASTERS: Environmental hazards, Environmental Disasters and Environmental stress- Meaning and concepts. Vulnerability and disaster preparedness

UNIT 2

TYPES OF ENVIRONMENTAL HAZARDS & DISASTERS: Natural hazards and Disasters – Volcanic Eruption, Earthquakes, Tsunamis, Landslides, Cyclones, Lightning, Hailstorms, Floods, Droughts, Cold waves, Heat waves and Fire.

UNIT 3

DISASTER MANAGEMENT: Emerging approaches in Disaster Management – Preparing hazard zonation maps, Predictability/forecasting & warning, Preparing disaster preparedness plan, Land use zoning, Communication.Disaster resistant house construction, Population reduction in vulnerable areas, Awareness Rescue training for search & operation at national & regional level immediate relief, Assessment surveys, Political Administrative Aspect, Social Aspect, Economic Aspect, Environmental Aspect.

UNIT 4

NATURAL DISASTER REDUCTION & MANAGEMENT: Provision of Immediate relief measures to disaster affected people, Prediction of Hazards & Disasters, Measures of adjustment to natural hazards

UNIT 5

ENVIRONMENTAL POLICIES & PROGRAMMES IN INDIA: A regional survey of Land Subsidence, Coastal Disaster, Cyclonic Disaster & Disaster in Hill with particular reference to India. Ecological planning for sustainability & sustainable development in India, Sustainable rural development A Remedy to Disaster, Role of Panchayats in Disaster mitigation, Environmental policies & programmers' in India – Institutions & National Centers for Natural Disaster reduction, Environmental Legislations in India, Awareness, Conservation Movement, Education & training.

REFERENCES:

1. R.B.Singh Environmental Geography, Heritage Publishers New Delhi 1990

2. Savinder Singh Environmental Geography, Prayag Pustak Bhawan
3. R.B Singh Disaster Management, Rawat Publication New Delhi 2000
4. H.K Gupta Disaster Management University Press, India

CONSTRUCTION TECHNIQUES AND MANAGEMENT (MTCESE302)

UNIT 1

CONSTRUCTION TECHNIQUES : Construction planning-Construction facilities, Schedules, Layout of Plant utilities, Construction methods

UNIT 2

EXCAVATION TECHNIQUES: Excavation and handling of Earth and Rock; Production and handling of Aggregates and Concrete

UNIT 3

DRAINAGE TREATMENTS : cooling of concrete in dams, Drainage treatment of aquifers/sub-terrainean reservoirs

UNIT 4

TUNNELING : Tunneling, Tunneling in soft rocks- Grouting , chimney formation, etc

UNIT 5

CONSTRUCTION MANAGEMENT : Construction control and management-CPM/PERT, Human Factors, Organization.

REFERENCES:

1. Raina V.K "Concrete bridge practice" , TaTa McGraw Hill Publishing Company, New Delhi, 1991.
2. Krishnaraju, N., "Design of Bridges "Oxford and IBH Publishing Co.,Bombay Calcutta,New Delhi, 1998
3. Bakht, B. and Jaegar,L.G., "Bridges Analysis simplified",McGraw Hill,1985.
4. Ponnuswamy, s.,"Bridges Engineering", TaTa McGraw Hill, 1973.

ADVANCED CONCRETE TECHNOLOGY (MTCESE303)

UNIT 1

MICROSTRUCTURE CONCRETE: Microstructure of concrete, deterioration mechanisms, assessment and control of corrosion in concrete structures

UNIT 2

SPECIAL CONCRETE : Introduction to Special concretes, their specific properties & applications: Ready Mixed Concrete, Reactive powder concrete, Bacterial concrete, Light Weight concrete, High density concrete & its application for Radiation shielding.

UNIT 3

FIBER REINFORCED CONCRETE : Fiber reinforced concrete - Fiber materials, mix content, distribution and orientation, interfacial bond, properties in fresh state, strength and behavior in tension, compression and flexure of steel fiber reinforced concrete

UNIT 4

MECHANICAL PROPERTIES : mechanical properties, crack arrest and toughening mechanism, applications. High strength concrete – constituents, mix proportioning, properties in fresh and hardened states, applications and limitations.

UNIT 5

HIGH PERFORMANCE CONCRETE : High performance concrete and self compacting concrete: Materials, mix design, techniques for performance measurement

References:

1. Clough & Penzien, “Dynamics of Structures”.

2. Meirovitch.L, “Elements of Vibration Analysis”.

3. W.T. Thomson , “Vibration Theory and Applications”.

4. M.Mukhopadhyay , “Vibrations, Dynamics & Structural systems”.

5. Paz Mario, “Structural Dynamics–Theory and Computation”.

6. Denhartog, “Mechanical vibrations”.

7. Timoshenko, “Vibration Problems in Engineering”.

8. Anil K Chopra, “Dynamics of structures”, Pearson Education.

HIGH RISE STRUCTURES (MTCESE304A)

UNIT 1

MULTISTOREY BUILDINGS : Introduction, Structural Systems For Buildings, Load Bearing Masonry Buildings, Framed Buildings, Selection Of Structural System, Types Of Floors, One-Way Slab Systems, Two Way Slab Systems, Flat Slab Systems, Flat Plate Systems, Grids

UNIT 2

TYPES OF STAIRS : Introduction, Common Types Of Stairs, Central-Wall Type Stairs, Central-Column Type Stairs, Slab less Stairs, Helicoidal Stairs, Free Standing Stairs

UNIT 3

MASONRY BUILDINGS : Introduction, Brick Wall Design Under Vertical Loads, Brick Wall Under Horizontal Loads, Resistance To Earthquake Forces By Wall Boxes, Loads, Multistory Buildings, Response Reduction Factor, 2d Analysis, 3d Analysis, Analysis For Vertical Loads

UNIT 4

FRAMED BUILDINGS UNDER VERTICAL LOADS : Introduction, Frame Analysis Under Vertical Loads, Approximate Analysis By Substitute Frame Method, Interaction At Junction Of Reinforced Concrete Elements, Exact Column Loads And Moments, Approximate Methods For Column Loads And Moments, Analysis For Lateral Loads, Analysis For Lateral Loads

UNIT 5

FRAMED BUILDING UNDER HORIZONTAL LOADS : Introduction, Allocation Analysis, Frame Analysis, Torsion In Buildings, Multistory Buildings Shear walled buildings under horizontal loads Introduction, Allocation Analysis, Response Of Structure, Effect Of Joint Width, Monolitihic Beam or Column Joints Foundations Introduction, Shallow Foundations, Deep Foundations

References:

1. Clough & Penzien, "Dynamics of Structures".

2. Meirovitch.L, "Elements of Vibration Analysis".

3. W.T. Thomson , "Vibration Theory and Applications".

4. M.Mukhopadhyay , "Vibrations, Dynamics & Structural systems".

5. Paz Mario, "Structural Dynamics–Theory and Computation".

THEORY OF PLATES AND SHELLS (MTCESE304B)

UNIT 1

Plates:- Introduction- classification of plates- thin plates and thick plates – assumptions in the theory of thin plates- Differential equation for cylindrical bending of rectangular Plates.

UNIT 2

Pure bending of plates:- slope and curvature of slightly bent plates – relation between bending moment and curvature in pure bending – stresses acting on a plate inclined to x and y axes-Particular cases of pure bending of rectangular plates.

UNIT 3

Laterally loaded rectangular plates:- Small deflections of Laterally loaded thin plates-Differential equation of plates- derivation of fourth order differential equation –Solution techniques for fourth order differential equation – boundary conditions – simply supported, built- in and free edges.

UNIT 4

Circular plates – polar coordinates – differential equation of symmetrical bending of laterally loaded circular plates- uniformly loaded circular plates with clamped edges and simply supported edges– circular plates loaded at the centre.

UNIT 5

Classical theory of Shells – Structural behaviour of thin shells – Classification of shells –Singly and doubly curved shells with examples – Membrane theory and bending theory of doubly curved shells.- equilibrium equations. Folded plates – Introduction, Classification, Structural action and analysis.

References:

1. Lloyd Hamilton Donnell, “Beams, plates and shells”, Mc Graw Hill, New York.

2. S.P Timoshenko, S.W Krieger, “Theory of plates and shells”, Mc Graw Hill.

3.Owen F Hughes, “Ship structural design”, John Wiley & Sons, New York, 1983.

4. William Muckle, “Strength of ship structures”, Edqward Arnold Ltd, London,1967.

5. Gol’oenveizen, “Theory of elastic thin shells”, Pergaman press, 1961.

ADVANCED FOUNDATION ENGINEERING (MTCESE304C)

UNIT –1

Bearing capacity of Footings subjected to Eccentric and Inclined Loading –Meyrhoff’s and Hanse’s theories –elastic settlement of Footings embedded in sands and clays of Infinite thickness –Footings on soils of Finite thickness-Schmertamaunn’s method, Jaubu and Morgenstern method.

UNIT –2.

Pile Foundations –settlement of Pile groups resting in sands and clays –Negative skin friction –in single piles and groups of piles –under –reamed piles –specifications –load –carrying capacity in sands and clays.

UNIT –3.

Caissons and well foundations : Types of caissons –well foundation Different shapes of wells – Components of wells –functions and Design –Design Criteria –Sinking of wells –lateral stability by Terzaghi's analysis.

UNIT –4.

Cantilever sheet piles and anchored bulkheads Earth pressure diagram –Determination of Depth of embedment in sands and clays –Timbering of trenches-Earth pressure diagrams –Forces in struts.

UNIT –5

Foundations in Expansive soils –Problems in Expansive soils –Mechanism of swelling –Swell Pressure and Swelling potential –Heave foundation practices –Sand cushion –CNS cushion –under –reamed pile Foundations –Granular pile –anchor technique, stabilization of expansive soils.

REFERENCES:

1.Analysis and Design of Substractenes –Swami Saran

2.Basic and Applied Soil Mechanics –Gopal Ranjan and A.S.R.Rao

3.Soil Mechanics & Foundation Engineering, Foundation Engineering –II V.N.S. Murthy.

SEMINAR (MTCESE305)

SEMESTER IV								
THEORY PAPERS					**Marks Allocation**			**Credits**
Code	**Subject/Paper**	**L**	**T**	**P**	**IA**	**EA**	**Total**	
MTCESE401	Dissertation	0	0	0	300	400	700	12
	TOTAL				300	400	700	12

Note-:

The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format, thereafter he/she will have to present the progress of the work through seminars and progress reports. Seminar related to the project should be delivered one after starting of semester .The progress will be monitored through seminars and progress reports.

- **The Total Number of credits of the M-Tech(Civil Engineering) program=64.**
- **The award of the degree a student shall be required to earn the minimum of 60 credits.**

Dissertation (MTCESE401)