M.Tech. CIVIL ENGINEERING Batch 2016

Ist Semester

Sr. No.	Subject Code	Title of the Subject	Teaching Load/Week			Credits	Total Hrs/week	Evaluation Marks		Total
			L	T	P/D	C		Theory	Sessional	
1.	MTCE201	Composite Materials	3	1	-	4	4	100	50	150
2.	MTCE202	Hydrological Processes	3	1	-	4	4	100	50	150
3.	MTCE203	Pavement Design	3	1	-	4	4	100	50	150
4.	MTCE204	Geoenvironmental Engineering	3	1	-	4	4	100	50	150
5.	MTCE205	Advanced Structural Design	3	1	-	4	4	100	50	150
		Total	15	5	-	20	20	500	250	750

IInd Semester

Sr. No.	Subject Code	Title of the Subject	Teaching Load/Week			Credits	Total Hrs/week	Evaluation Marks		Total
			L	T	P/D	C		Theory	Sessional	
1.	MTCE206	Water Quality Modeling	3	1	-	4	4	100	50	150
2.	MTCE207	Earthquake Engineering	3	1	-	4	4	100	50	150
3.	MTCE208	Advanced Traffic Engineering	3	1	-	4	4	100	50	150
4.	MTCE	Elective - I	3	1	-	4	4	100	50	150
5.	MTCE	Elective - II	3	1	-	4	4	100	50	150
		Total	15	5	-	20	20	500	250	750

List of electives

Elective - I

MTCE209	Introduction to the Theory of Plasticity
MTCE210	Advance Bridge Design
MTCE211	Industrial Structures

Elective - II

MTCE212	Computational Geotechnics
MTCE213	Engineering Rock Mechanics
MTCE214	Soil Dynamics

IIIrd Semester

Sr. No.	Subject Code	Title of the Subject	Teaching Load/Week			Credits	Total Hrs/week	Evaluation Marks		Total
			L	T	P/D	C		Theory	Sessional	
1.	MTCE	Elective - III	3	1	-	4	4	100	50	150
2.	MTCE	Elective - IV	3	1	-	4	4	100	50	150
3.	**MTCE 221**	**Project**	-		8	8	8	50	50	100
4.	**MTCE 222**	**Seminar**	2	-	-	4	2	-	100	100
			8	2	8	20	18	250	250	500

List of electives

Elective - III

MTCE215 Urban Hydrology
MTCE216 Remote Sensing and GIS for Water Resources and Environmental Engineering
MTCE217 Ground Water and Contamination Hydrology

Elective - IV

MTCE218 Disaster Reduction & Management
MTCE219 Construction and Maintenance Management
MTCE220 Expert Systems in Civil Engineering

IVth Semester

Sr. No.	Subject Code	Title of the Subject	Teaching Load/Week			Credits	Total Hrs/week	Evaluation Marks		Total
			L	C	P/D	C	-	Theory	Sessional	
1.	MTCE 225	Dissertation	-	-	-	20	-	-	-	-

i. Each theory paper examination will be of three hours duration
ii. Seminar will be an independent study on the related topic and will be evaluated internally
iii. Thesis in the specified Area (Geotechnical Engineering/Structural Engineering/ Water Resources and Environmental Engineering)
iv. Thesis will be evaluated by the external examiner and the internal guide. The candidate is required to make presentation of his thesis work and Viva-voce will be held

Core Course

		L	T/P
MTCE201	**Composite Materials**	**3**	**1**

Supplementary Cementing Materials: Types of supplementary cementing materials such as fly ash, silica fume, rice husk ash, and metakaolin; their physical, chemical, mineralogical properties; Effects of these materials on the fresh properties; Strength properties; Durability properties.

Fibre Reinforced Concrete: Definition; types of fibres; Properties of fibres; Factors affecting FRC. Mixing and casting procedure; Composite materials approach; Effect of fibres on the workability, strength and durability of concretes; Applications of different types of fibres.

High Volume Fly Ash Concrete: Definition, Effect of types of fly ash in large quantities on the strength properties of concrete; Durability and abrasion resistance of HVFA; Applications of HVFA.

Self-Compacting Concrete (SCC): Definition, Advantages and disadvantages of SCC; Various mix design procedures; Tests for SCC; Applications for SCC.

High Performance Concrete: Definition of HPC; Material selection and its properties; Parameters for concrete being considered as HPC; Applications of HPC.

Polymer Concrete Composites: Definition; Types of monomers and polymers; Types of polymer concretes and their applications.

Fibre Reinforced Plastics (FRP): Types of FRP, their properties and effects on concrete elements under various loading conditions.

Use of Waste Materials and By-products: Types of waste materials and by-products such as waste glass, scrap tires, waste foundry sand, clean coal ash, etc. Effect of these materials on the various properties of mortar and concrete; Introduction of leachates from waste materials and their analysis.

Behaviour of Concrete at High Temperature: Definition of high temperature; Mechanism of concrete failure at high temperature; Spalling characteristics; Difference in the behaviour of normal concrete, High strength concrete and self-compacting concrete at high temperature.

Recommended Books

Nevelli, A. M., Properties of Concrete, Prentice Hall of India (1995). Siddique, R., Special Structural Concretes,
Galgotia Publications (2000). Krishna Raju, N., Concrete Mix Design, CBS Publications (2002). Gambhir, M. L.,
Concrete Technology, Tata-McGraw Hill, 3rd Edition (2008). Siddique, R., Waste Materials and By-products in Concrete, Springer (2008).

Core Course

		L	T/P
MTCE202	**Hydrological Processes**	**3**	**1**

Introduction to hydrological processes, Reynolds transport theorem, Energy & momentum principles, Unit Hydrograph and GIUH, Hydrograph analysis, Flood Propagation and Rooting, Land surface processes, Hydrologic Forecasting, Hydrologic statistics and frequency analysis, Hydrologic design, Groundwater movement and balance, Equations of flow, Well hydraulics, Groundwater recharge estimation, Groundwater modeling. Subsurface and channel processes. Watershed Model, Conceptual Models.

Recommended Books

Bedient, P. B., and Huber, W. C., Hydrology and Floodplain Analysis, Prentice Hall, 2002.

Chow, V.T., Maidment, D.R. and Mays, L.W,. Applied Hydrology, McGraw-Hill 1988.

Freeze, A.R., and Cherry, J.A., Ground Water, Prentice Hall, 1979.

Domenico, P.A., and Schwartz, F.W., Physical and Chemical Hydrogeology, John Wiley, 1990

Core Course

		L	T/P
MTCE203	**Pavement Design**	**3**	**1**

Subgrade: Various Tests and interpretation in pavement design. Aggregates: Types of aggregates and their properties and tests, batching processes. Binder: types of binders, Physical and chemical properties; Polymer and Rubber Modified binders. Relevant IS and IRC codes, Concrete as Pavement Material: Properties and testing, Concrete Technology in Pavements. Fly ash and its characterisation. Performance based mix Design approaches. Viscoelastic properties of bitumen and bituminous mixtures. Construction Methods: Bituminous and Concrete Pavements. Design pavement structure. Stresses in rigid and flexible pavements, sub-grade evaluation. Design of flexible, semiflexible and rigid pavements. Temperature stresses and joints. Pavement management System; Rehabilitation of Pavements; Pavement Inventories and Evaluation; Quality Control; Pavement Lifecycle and cost analysis.

Recommended Books

Rajib B Mallick and Tahar El-Korchi, Pavement Engineering, Principles and Practice, CRC Press, 2009
Huang, Y.H, Pavement Analysis and Design, Prentice-Hall, New Jersey, 1993.
E. J. Yoder, M. W. Witczak, Principles of Pavement Design, Wiley New York, 1975.

Core Course

		L	T/P
MTCE204	**Geo-environmental Engineering**	**3**	**1**

Geoenvironmental Engineering; Waste generation; subsurface contamination, waste containment; Types of landfills, design and operation of landfills, subsurface contamination control and remediation.
Sources and effects of subsurface contamination; Physical, chemical and biological characteristics of solid wastes; Soil-waste interaction; Contaminant transport; Laboratory and field evaluation of permeability; Factors affecting permeability; Waste disposal on land.
Types of landfills: Siting criteria; Waste containment principles; Types of barrier materials; Barrier systems-basic concepts, design and construction, stability, compatibility and performance. Transport in subsurface Engineering properties Planning and design aspects relating to waste disposal in landfills, in ash ponds and tailing ponds, and in rocks.
Environmental monitoring around landfills; Detection, control and remediation of subsurface contamination; and geotechnical reuse of waste materials such as coal ash, mining waste, demolition waste etc;
Reclamation of old waste dumps; Regulations; Contaminated site remediation Case studies.

Recommended Books

Daniel, D. E., Geotechnical Practice for Waste Disposal, Chapman and Hall, London, 1993.

Reddi, L. N., and Inyang, H. F. Geoenvironmental Engineering- Principles and Applications Marcel Dekker, Inc., 2000.

Sharma, H. D., and Lewis, S.P. Waste Containment Systems, Waste Stabilization and Landfills: Design and Evaluation, John Wiley & Sons, Inc. New York, 1994.

Core Course

		L	T/P
MTCE205	**Advanced Structural Design**	**3**	**1**

Building Frames: Introduction, Loads, Analysis for vertical loads, Analysis for lateral loads, Concept of redistribution of moments, Reinforcement detailing in various components.

Retaining Walls: Review of design of cantilever type retaining walls, Design of counterfort retaining walls.

Special Structural Elements: Domes, Deep Beams, Brackets or Corbels, Grid floor systems.

Flats Slabs: Advantages and disadvantages of flat Slabs, Action of Flat Slab, Preliminary design of flat slabs, Basic action of two-way slab, Determination of minimum thickness of slab, Direct Design Method, Equivalent frame analysis of flat slabs.

Yield Line Theory: Introduction, Assumptions, Location of yield lines, Methods of Analysis, Analysis of one-way and two-way slabs.

Recommended Books

Jain, A.K., Reinforced Concrete-Limit State Design, Nem Chand & Bros (1999),

Varghese, P. C., Limit State Design of Reinforced Concrete, PHI Publishers (2002).

Core Course

		L	T/P
MTCE206	**Water Quality Modeling**	**3**	**1**

Basic characteristics of water quality, stoichiometry and reaction kinetics. Mathematical models of physical systems, completely and incompletely mixed systems. Movement of contaminants in the environment. Water quality modeling in rivers and estuaries - dissolved oxygen and pathogens. Water quality modeling in lakes and ground water systems.

Recommended Books

Chapra, S.C., Surface Water Quality Modeling, McGraw Hill, 1997.
Tchobanoglous, G., and Schroeder, E.D., Water Quality, Addison Wesley, 1987

Core Course

		L	T/P
MTCE207	**Earthquake Engineering**	**3**	**1**

Introduction to engineering seismology. Plate tectonics. Earthquake magnitude. Ground motion, Engineering problems involving soil dynamics; Role of inertia; Theory of Vibrations: Single and two-degree freedom systems, vibration-measuring instruments, vibration isolation, Wave propagation in elastic media. Effect of local soil conditions on ground motion, General nature of soil behaviour under cyclic/dynamic loading; Field and Laboratory tests for measurement of small strained and large strain, dynamic properties of soils. Design criteria for machine foundations, elastic homogeneous half space solutions, lumped parameter solutions. Codal provisions. Strong Ground Motion: Measurement, characterization and estimation. Amplification theory and ground response analysis. Densification and liquefaction of granular soils, Seismic slope stability analysis, foundations and earth retaining structures for seismic loading. Case histories. Mitigation techniques and computer-aided analysis. Seismic bearing capacity and earth pressures. Codal provisions.

Recommended Books

Geotechnical Earthquake Engineering By Steven L. Kramer, Pearson Education, 2003.

Geotechnical Earthquake Engineering Handbook, Robert W. Day, McGraw-Hill, 2002

Core Course

		L	T/P
MTCE208	**Advanced Traffic Engineering**	**3**	**1**

Functional Classification of Highway System; Design Controls – Topography, Driver characteristics, Vehicle Characteristics, Traffic, Capacity and Level of Service, Design Speed. Objectives of Geometric Design, Cross Section Elements: Design specifications; Pavement Surface characteristics – Skid Resistance, Road Roughness; Camber, Objectives, design standards. Specifications for hill roads. Horizontal Alignment of Roads: Sight Distances – Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance ; Objectives of horizontal curves; Super elevation; Extra- widening on Curves; Transition Curves – Objectives and Design. Transition Curve setting methods, Introduction to MX Roads software. Vertical Alignment of Roads: Gradients – Types of Gradients, Design Standards; Vertical Curves – Summit Curves, Valley Curves and Design criteria for Vertical Curves; Importance of Sight Distances for Horizontal and Vertical Curves ; Combination of Vertical and Horizontal Curves – Grade Compensation, Geometric Design of Intersections : Types of Intersections; Design Principles for Intersections; Design of At-grade Intersections – Channelization, Objectives; Traffic Islands and Design standards; Rotary Intersection – Concept, Advantages and Disadvantages; Grade separated Interchanges – Types, warrants and Design standards. Miscellaneous Elements: Requirements of Pedestrians; Pedestrian facilities on Urban Roads; Cycle Tracks – Guidelines and Design standards; Bus bays –Types and Guide lines; Design of On-street and Off street Parking facilities – Guidelines for lay out Design, Traffic Signs and Markings.

Recommended Books

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

Highway Engineering, C.E.G.Justo and S.K.Khanna, Nem Chand and Brothers.

IRC Codes for Signs, Markings and Mixed Traffic Control in Urban Areas.

Elective Course

		L	T/P
MTCE209	**Introduction to the Theory of Plasticity**	**3**	**1**

1D plasticity and viscoplasticity; physical basis of plasticity; uniaxial tensile test & Bauschinger effect; phenomenological basis of assumptions in plasticity; Levy-Mises equations; yield criteria (Tresca, von Mises, Mohr-Coulomb, Drucker-Prager); geometry of yield surfaces; flow rules and hardening ; plastic / viscoplastic potentials; Drucker's postulate;convexity; normality; Illyushin's principle; shakedown; problems in rigid-perfectly plastic solids; slipline fields; introduction to upper and lower bounds; selected rigid-perfectly plastic and elastic-plastic boundary value problems; advanced hardening models; introduction to computational plasticity; radial return and other integration algorithms

Recommended Books

Chakrabarty, J. Theory of Plasticity, Butterworth, 2006

Calladine, C.R., Plasticity for Engineers, Woodhead, 2000

Lubliner J., Plasticity Theory, Dover, 2008

Elective Course

		L	T/P
MTCE210	**Advance Bridge Design**	**3**	**1**

General: Bridge System, Considerations in alignment, Planning, Economic consideration, Aesthetics and selection of type of bridge (Review).
Loading Standards: Standards followed in India, U.K., U.S.A. and Europe.
Super Structure Analysis: Bridge deck analysis using different methods, Load distribution theories – Courbon specifications for loading, Geometrical proportioning etc. of road, rail-cum-road bridges. Indian Road Congress (IRC) and Indian Railway Loading standards and their comparison with loading, Hendry-Jaegar, Morris-Little (Orthotropic plate theories) methods, Stiffness method, Finite difference method, Folded Plate method, Finite strip method and Finite Element method (General treatment), Limit analysis, Design of bridge decks.
Connections: Design of different connections, Bearings and joints.
Substructure Analysis and Design: Piers, Abutments, Wing walls and other appurtenant structures.
Foundations: Well foundations and pile foundation, Design and construction and field problems.
Construction & Maintenance: Erection of bridge super structure, Maintenance, Rating and Strengthening of existing bridges.
Dynamics Behaviour: Behaviour of bridges under dynamic loads, Discussion of code provisions for design of bridges for wind and earthquake forces.
Long Span Bridges: General discussion of suspension and cable stayed bridges.

Recommended Books

Bakht, B. and Jaeger, L.G., Bridge Analysis Simplified, McGraw-Hill Book Company (1985),Cusens, A.R. and Parma, R.P., Bridge Deck Analysis, John Wiley & Sons Ltd. (1975), Hambly, E.C., Bridge Deck Behaviour, Chapman and Hall. (1991,Krishna Raju, N., Design of Bridges, Oxford and IBH Publications (1998), Ponnuswamy, R., Bridge Engineering, Tata McGraw Hill (1997), Relevant Road & Railway Codes for Bridges,Raina, V K, Concrete Bridge Practice, Tata McGraw Hill Publications (1991).

Elective Course

		L	T/P
MTCE211	**Industrial Structures**	**3**	**1**

Review of Plastic Design: Concept of minimum weight design
Design of Industrial Buildings: General, Framing, Crane girders & columns, Analysis of trussed bents, Design of industrial frame.
Design of Storage Structures: Design of containers like bunkers, silos.
Design of Space Structures: Transmission towers, Steel domes, Pre-cast building components.
Design using Light Gauge Sections: Structural use of pressed sections and light gauge sections, Aluminium as a material of construction for industrial structures and design of such structures, Tubular structures and Sandwich plate construction.
Aluminium structures: Introduction, Permissible stresses, Tension members, Compression members, Design of beams, Local buckling of compression elements, Riveted and bolted construction, Design of chimneys, Load analysis, Design of steel supporting chimney, Chimney foundation
Construction Practices: Shop practice in steel construction, Fabrication erection and production.

Recommended Books

Ajmani, A. L. and Arya, A. S., Design of Steel Structures, Nem Chand and Brothers (2000),Dunham, C.W., Planning of Industrial Structures, John Wiley and Sons (2001),Gary, W., Steel Designer's Manual, Prentice Hall (2008),Glower, F., Structural Pre-Cast Concrete, Oxford Publishers (2008).

Elective Course

			L	T/P
MTCE212	**3**	**Computational Geotechnics**	**1**	**3**

Introduction to numerical modeling in geotechnical engineering. Review of basic concepts. Solution of nonlinear systems of equations. Finite difference method. Finite element method. Discrete element method. Measured soil response. Constitutive modeling of soil response. Artificial Neural Networks. Using finite difference, finite element and discrete element computer codes. Application for solving geotechnical engineering problems.

Recommended Books

Desai, C.S. and Christian, J.T. Eds. Numerical Methods in Geotechnical Engineering, McGraw-Hill, 1977.
Bathe, K.J., Finite Element Procedures in Engineering Analysis, Prentice-Hall, Englewood Cliffs, NJ, 1982.
Wood, D.M., Soil Behavior and Critical State Soil Mechanics, Cambridge University Press, New York, 1990.

Elective Course

			L	T/P
MTCE213	**3**	**Engineering Rock Mechanics**	**3**	**1**

Rock as an engineering material, Geological factors affecting rocks, Stress, Strain and Strength of rocks, Insitu stresses in rock, Intact Rock - Elastic Deformation, Discontinuities and deformability and strength of rock masses, permeability, anisotropy and in homogeneity in rocks, Stereonet Analysis, testing techniques, rock mass classification, Failure criteria for rock and rock masses, Rock mechanics interactions and rock engineering systems, Excavation and stabilization principles, rock slope stability, foundations on rock, rock blasting support and reinforcement, Underground excavation and stability, Urban tunnels, Problematic Rocks - Rock Engineering, Modern modelling techniques & analyses in rocks

In-situ stresses in rocks and their measurement. Strength and deformation behaviour of discontinuities in rocks. Deformation behaviour of rocks and rock masses. Time dependent behaviour of rocks. Application of Rock Mechanics to Underground Structures, Slopes and Foundations. Improving the properties of insitu rock masses.

Recommended Books

Engineering Rock Mechanics: an Introduction to the Principles, 1997. Hudson J.A. and J.P. Harrison. Elsevier, Oxford

Introduction to Rock Mechanics by R.E.Goodman, John Wiley & Sons.

Engineering in Rocks for Slopes, Foundation and Tunnels, Editor T.Ramamurthy, Prentice Hall India Pvt. Ltd.

Related codes and manuals from International Society of Rock Mechanics, ASTM and Bureau of Indian Standards

Elective Course

			L	T/P
MTCE214	**3**	**Soil Dynamics**	**3**	**1**

Fundamental of vibrations; analysis of free and forced vibrations using spring dashpot model; equations' formulation and solution; block vibration test for determining stiffness and damping coefficient of soil mass; formulation of the problem for the multi-degree freedom system. Theories for foundations on elastic half space; effect of different pressure distribution; comparison with spring-dashpot model. Wave propagation in bar and elastic media; different types of waves; dynamic tests for determination of elastic and shear modulus. Geophysical survey using reflection, refractionsteady state vibration and cross hole shear tests. Liquefaction analysis; cyclic shear test; assessment of zone of liquefaction. Seismic bearing capacity of foundations and seismic earth pressures. Vibration isolations

Recommended Books

Richart, F.E., Woods, R.D. and Hall, J.R. Vibrations of soils and foundations. Prentice-Hall, 1970.
Major, A. Vibration Analysis and Design of Foundations for Machines and Turbines. Collets, 1962.
Robert W. Day. Geotechnical Earthquake Engineering Handbook McGraw-Hill.

Elective Course

		L	T/P
MTCE215	**Urban Hydrology**	**3**	**1**

Review of basic hydrology. Storm water runoff generation; return period; hydrologic risk; frequency analysis – IDF relationships; open channel flow in urban watersheds; interception storage, infiltration, depression storage; combined loss models; estimation of runoff rates from urban watersheds; flow routing; storm water drainage structures; storm water detention; structural and non-structural control measures; Source control techniques; urban storm water models. Introduction to urban ground water systems.

Recommended Books

Butler, D. & Davies, J.W., Urban Drainage, Spon Press, 2nd Edn., 2004.
Akan A.O and Hioughtalen R.J., Urban Hydrology, Hydraulics and Storm Water Quality – Engineering Applications and Computer Modeling, John Wiley & Sons 2003.
Hall, M.J., Urban Hydrology. Elsevier, 1984.
Shaw, E.M., Hydrology in Practice, 3rd Edn., Chapman & Hall, 1994

Elective Course

		L	T/P
MTCE216	**Remote Sensing and GIS for Water Resources & Environmental Engg**	**3**	**1**

Basic concepts of remote sensing. Airborne and space borne sensors. Digital imageprocessing. Geographic Information System. Applications to rainfall - runoff modeling. Watershed management. Irrigation management. Vegetation monitoring. Drought and flood monitoring. Environment and ecology. Introduction to digital elevation modeling and Global Positioning System (GPS). Use of relevant software for remote sensing and GIS applications

Recommended Books

Lillesand T.M. and Kiefer R.W. Remote Sensing and Image Interpretation, John Wiley & Sons, 2000.
Sabins, F.F. Remote Sensing - Principles and Interpretation, Freeman & Co., New York, 1986.
Heywood, I., Cornelius, S., and Carver, S. An Introduction to Geographical Information Systems, Pearson Education, 1998

Elective Course

		L	T/P
MTCE217	**Ground Water and Contaminant Hydrology**	**3**	**1**

Groundwater movement and balance, equations of flow. Well hydraulics: Models and methods, pumping tests, slug tests, aquifer tests - porous and fractured media, regional groundwater resources evaluation, groundwater recharge, groundwater monitoring, groundwater quality, mass transport in groundwater. Tracer tests. Scale effects of dispersion. Solute transport modeling. Transport in fractured media

Recommended Books

Freeze, A.R., and Cherry, J.A., Ground Water, Prentice Hall, 1979.
Domenico, P.A., and Schwartz, F.W., Physical and Chemical Hydrogeology, John Wiley, 1990.
Batu, V., Aquifer Hydraulics, John Wiley, 1998.
Lerner, D.N., Issar, A.S., and Simmers, I., Groundwater Recharge, International Contributions to Hydrogeology, Vol.8, Verlag Heinz Heise, 1990.
Nielsen, D.M., Practical Handbook of Groundwater Monitoring, Lewis Publishers, 1991

Elective Course

		L	T/P
MTCE218	**Disaster Reduction & Management**	**3**	**1**

1. Disaster Reduction

Earthquake resistant design of structures, Response spectra and design earthquake parameters, Principles and philosophies, Codal provisions, Factors affecting damage to structures, Enforcement of codal provisions, Strong motion instrumentation and data processing, Effective rescue operation, General planning and design aspects,

Conventional earthquake resistant design, Seismic base isolation method, retrofitting, Training and lecturing at various levels, Preparedness to meet earthquake disaster, Programmes for public awareness, demonstrations and exhibitions, Information management (Safety, emergencies, management and planning, design, response, user experience problems and case studies), Proper land use practices, long term disaster preparedness measures.

Precautions after a major earthquake, Preparedness for medical supply Emergency care (First aid, Home remedies), Disposal of dead bodies (Human and Cattle) , Care for old and orphans.

2. Indirect Damages

Damage due to ground failures, Landslides, rockslides, liquefaction, fire, floods, tsunamis, release of hazardous material like poisonous gas, nuclear radiation.

3. Disaster Management

Management cell, Central crisis management core group, damage reconnaissance, Management of relief and rehabilation (Infrasture rehabilation, Housing rehabilation, Social rehabilation), Role of volunteers, Emergency operation centres, Information system, Danger zone restrictions, Cooperation with local authority, Coordination for international relief, Role of givernment, NGO's, Bussiness and donors, Role of remote sensing in relief operations, Information management and related technologies in engineering and disaster management.

The design and management of Disaster Information Resource Network, Asian Disaster Preparedness Centre, Regional data base, Contacts and Sources, CD – ROM Library for Natural Disaster Management, Regional Disaster Documentation Centre, Non Governmental Organisations.

Elective Course

		L	T/P
MTCE219	**Construction and Maintenance Management**	**3**	**1**

1. Services in Residential, Commercial and Medical buildings
(A) Sanitation, water supply, electric wiring, rain water disposal, lighting & illumination, calculation methods for these services
(B) Air Conditioning & Ventilation: Natural ventilation, control cooling systems, modern systems of air conditioning, ducting systems, different mechanical means of air conditioning.
(C) CCD-CS: General principles of transmission and passage of sound reverberation, absorption, reflection, acoustic materials and their coefficiency, principles of good acoustic design.
(D) Thermal Insulation: Behavior of various building materials & thermal conductivity. Thermal insulation for air conditioned interior spaces, working out air conditioning loads for different spaces.
(E) Fire Safety Dye.
2. Architectural controls and building byelaws : Role of building byelaws in a city, local byelaws and architectural controls, façade control and zoning plans.
3. Regional planning: Understanding of physical, social and economical parameters
for regional planning.
4. Landscaping: Forces of man and nature, their relationship and effect on shaping
landscape, site analysis, site and.

Elective Course

		L	T/P
MTCE220	**Expert Systems in Civil Engineering**	**3**	**1**

Chapter –I Introduction
History of expert system research e.g. aquittance with researchers and their research fields. Current research activities. Conventional programs vs. Expert Systems Advantages and limitations of expert systems
Chapter –II Architecture of an expert system Components of expert system Knowledge base, Inference mechanism User Interface
Chapter –III Knowledge base Knowledge Engineering. Nature of expert knowledge., Knowledge acquisition and knowledge representative e.g. rule based systems, Semature nets, frames, Validity nature base , working memory
Chapter –IV Inference Engine and user interface, Techniques for inference mechanism, forward chaining and backward chaining , Interface language, terminal interface
Chapter-V Development of expert systems Problem formulation, Search spaces, Task for expert system, application to engineering analysis and design, Consideration , Operations Representative application in Civil engg.
There will be project for developing an expert system by small group of students using the profile of a given shell. The project will carry 50 sessional marks.

References:
A guide to expert system- Waterman D.A.
Introduction to expert systems- Jackson, P.