MAHATMA GANDHI UNIVERSITY

SCHEME AND SYLLABI

FOR

M. Tech. DEGREE PROGRAMME

IN

CIVIL ENGINEERING

WITH SPECIALIZATION IN

STRUCTURAL ENGINEERING AND CONSTRUCTION MANAGEMENT

(2011ADMISSION ONWARDS)

SCHEME AND SYLLABI FOR M. Tech. DEGREE PROGRAMME IN CIVIL ENGINEERING WITH SPECIALIZATION IN STRUCTURAL ENGINEERING AND CONSTRUCTION MANAGEMENT

SEMESTER - I

Sl. No.	Course No.	Subject	Hrs / Week			Evaluation Scheme (Marks)					Credits (C)
			L	T	P	Sessional			ESE	Total	
						TA	CT	Sub Total			
1	MCESC 101	Analytical Methods in Engineering	3	1	0	25	25	50	100	150	4
2	MCESC 102	Advanced Design of Concrete Structures	3	1	0	25	25	50	100	150	4
3	MCESC 103	Theory of Elasticity	3	1	0	25	25	50	100	150	4
4	MCESC 104	Construction Management	3	1	0	25	25	50	100	150	4
5	MCESC 105	Elective – I	3	0	0	25	25	50	100	150	3
6	MCESC 106	Elective – II	3	0	0	25	25	50	100	150	3
7	MCESC 107	Advanced Structural Engineering Lab	0	0	3	25	25	50	100	150	2
8	MCESC 108	Seminar – I	0	0	2	50	0	50	0	50	1
Total			**18**	**4**	**5**	**225**	**175**	**400**	**700**	**1100**	**25**

Elective – I (MCESC 105)		Elective – II (MCESC 106)	
MCESC 105 - 1	Bridge Engineering	MCESC 106 - 1	Advanced construction techniques
MCESC 105 - 2	Design of Substructures	MCESC 106 - 2	Construction methods and Equipments
MCESC 105 - 3	Advanced Concrete Technology	MCESC 106 - 3	Energy Conservation Techniques in Building Construction
MCESC 105 - 4	Advanced steel Structures	MCESC 106 - 4	Quality Control And Safety Management

L – Lecture, **T** – Tutorial, **P** – Practical

TA – Teacher's Assessment (Assignments, attendance, group discussion, Quiz, tutorials, seminars, etc.)

CT – Class Test (Minimum of two tests to be conducted by the Institute)

ESE – End Semester Examination to be conducted by the University

Electives: New Electives may be added by the department according to the needs of emerging fields of technology. The name of the elective and its syllabus should be submitted to the University before the course is offered.

SEMESTER - II

Sl. No.	Course No.	Subject	Hrs / Week			Evaluation Scheme (Marks)					Credits (C)
			L	T	P	Sessional			ESE	Total	
						TA	CT	Sub Total			
1	MCESC 201	Earthquake Resistant Design of Structures	3	1	0	25	25	50	100	150	4
2	MCESC 202	Structural Dynamics	3	1	0	25	25	50	100	150	4
3	MCESC 203	Theory of Plates& Shells	3	1	0	25	25	50	100	150	4
4	MCESC 204	Project Planning and Implementation	3	1	0	25	25	50	100	150	4
5	MCESC 205	Elective – III	3	0	0	25	25	50	100	150	3
6	MCESC 206	Elective – IV	3	0	0	25	25	50	100	150	3
7	MCESC 207	Software Laboratory	0	0	3	25	25	50	100	150	2
8	MCESC 208	Seminar – II	0	0	2	50	0	50	0	50	1
Total			**18**	**4**	**5**	**225**	**175**	**400**	**700**	**1100**	**25**

Elective – III (MCESC 205)		Elective – IV (MCESC 206)	
MCESC 205 - 1	Structural Stability	MCESC 206 - 1	Construction planning, scheduling and control
MCESC 205 - 2	Prestressed Concrete	MCESC 206 - 2	Civil Engineering Material Science
MCESC 205 - 3	Advanced Theory of Concrete structures	MCESC 206 - 3	Air pollution Control
MCESC 205 - 4	Experimental Stress Analysis	MCESC 206 - 4	Environment and Pollution

L – Lecture, **T** – Tutorial, **P** – Practical

TA – Teacher's Assessment (Assignments, attendance, group discussion, Quiz, tutorials, seminars, etc.)

CT – Class Test (Minimum of two tests to be conducted by the Institute)

ESE – End Semester Examination to be conducted by the University

Electives: New Electives may be added by the department according to the needs of emerging fields of technology. The name of the elective and its syllabus should be submitted to the University before the course is offered.

SEMESTER - III

Sl. No.	Course No.	Subject	Hrs / Week			Evaluation Scheme (Marks)					Credits (C)
			L	T	P	Sessional			ESE** (Oral)	Total	
						TA*	CT	Sub Total			
1	MCESC 301	Industrial Training / Mini Project	0	0	20	50	0	50	100	150	10
2	MCESC 302	Master's Thesis Phase - I	0	0	10	100***	0	100	0	100	5
Total			**0**	**0**	**30**	**150**	**0**	**150**	**100**	**250**	**15**

* TA based on a Technical Report submitted together with presentation at the end of the Industrial Training / Mini Project

** Evaluation of the Industrial Training / Mini Project will be conducted at the end of the third semester by a panel of examiners, with at least one external examiner, constituted by the University.

*** The marks will be awarded by a panel of examiners constituted by the concerned institute

SEMESTER - IV

Sl. No.	Course No.	Subject	Hrs / Week			Evaluation Scheme (Marks)					Credits (C)
			L	T	P	Sessional			ESE** (Oral & Viva)	Total	
						TA*	CT	Sub Total			
1	MCESC 401	Master's Thesis Phase - II	0	0	30	100	0	100	100	200	15
2	MCESC 402	Master's Comprehensive Viva							100	100	
Total										**300**	**15**
Grand Total of all Semesters										**2750**	**80**

* 50% of the marks to be awarded by the Project Guide and the remaining 50% to be awarded by a panel of examiners, including the Project Guide, constituted by the Department

** Thesis evaluation and Viva-voce will be conducted at the end of the fourth semester by a panel of examiners, with at least one external examiner, constituted by the University.

MCESC 101 ANALYTICAL METHODS IN ENGINEERING

L	T	P	C
3	1	0	4

Module 1: Differential equations

Linear differential equations–homogeneous equations–boundary value problems–Cauchy–Euler equations–factoring the operator–nonhomogeneous equations–variation of parameters

Module 2: Partial differential equations

Ordinary differential equations in more than two variables – first order P.D.E–integral surface passing through a given curve–surfaces orthogonal to given system–compatible systems of first order P.D.E–charpits method–solution satisfying the given conditions–P.D.E second order in physics–linear P .D.E with constant coefficients.

Module 3: Boundary value problems

Elementary solutions of Laplace equations, wave equations, series solution of these equations in two dimensions–related problems in engineering.

Module 4: Numerical solutions of P.D.E

Ordinary differential equation – first order equation – solution by use of Taylor series – Euler's method and its modification – Runge Kutta method – Higher order equation of the initial value type- Predictor- corrector methods-Milne's method and Hamming's method.

References:

1. Michael D. Greenberg (1988), "Advanced Engineering Mathematics", Pearson education.
2. Ian Sneddon, "Elements of Partial Differential Equations", McGraw Hill, International Editions . McGraw-Hill, Singapore, 1986.
3. B.S Grewal (2001), "Numerical Methods in Engineering and Science", Khanna Publishers, New Delhi.
4. P. Kandasamy, K. Ganavathi, (2008), "Numerical Methods", S Chand and company limitted.
5. S.Arumugam,A. Thangapandi Issac, "Numerical methods", Scitech.
6. George.F. Simmons, "Differential Equations with applications and historical notes", TMH Edition.

MCESC 102 **ADVANCED DESIGN OF CONCRETE STRUCTURES**

L	T	P	C
3	1	0	4

Module 1: Yield line method of analysis of slabs

Characteristic features of yield lines– virtual work method – equilibrium method Strip method of analysis of slabs–Design of grid floor –Approximate method– Rigorous method.

Module 2: Design of continuous beams

Redistribution of moments– Design of frames– Bunkers and silos – Airy's theory– Janssen's theory.

Module 3: Design of special RC elements

Design of slender columns– RC walls–ordinary and shear walls–Corbels– Deep beams .

Module 4: Design of flat slabs

Introduction–components–IS Code recommendations–design methods–design for flexure and shear–moments in columns

References:

1. Pippard A J S, and Baker, J. F. (1957), "The Analysis of Engineering Structures", Edward Arnold Publishers Ltd, London.
2. Krishna Raju N. (1989), "Advanced Reinforced Concrete Design", CBS Publishers and distributers, New Delhi.
3. Krishna Raju. (2003), "Design of Reinforced Concrete Structures" , CBS publishers and distributors, new Delhi.
4. Punmia B. C., Ashok K Jain,Arun K Jain , "Reinforced Concrete", Vol:II, Laxmi Publications, New Delhi
5. P C Varghese, "Limit State Design of reinforced concrete structures".
6. Rajagopalan, "Design of Storage structures".
7. Reynold & Steedman (1551) "Designers handbook"
8. Relevant IS Codes.
9. Menon & Pillai – "Design of R.C.C. Structures"

MCESC 103 **THEORY OF ELASTICITY**

L	T	P	C
3	1	0	4

Module 1: Elasticity- Basic concepts

Body force–Surface traction–Stresses and strains–Three dimensional stresses and strains–analysis–transformation equations of 3D stresses & strains–principal stresses & strains–States of stresses & strain–Equilibrium equations–generalised Hooke's Law–Compatibility Conditions–Boundary conditions.

Module 2: Two dimensional stress–strain problems

Plane stress and plain strain– Analysis–transformation equations–stress–strain relations–equilibrium equations in Cartesian and polar co ordinates Airy's stress function–Biharmonic Equilibrium–St Venant's principle–2D problems in Cartesian coordinate–cantilever with concentrated load at free end– Simply supported With UDL–Cantilever with moment at free end.

Module 3: Analysis of axisymmetric problems and Torsion

General equations in polar co ordinates–Stress distribution symmetric about an axis–Cylinder subjected to external and internal pressures– Rotating disc as a 2D problem. Effect of circular hole in stress distribution of plates.

Torsion of prismatic bar– General solution–Warping function approaches – St. Venant's theory– Membrane analogy– Sand heap analogy– Torsion of Non Circular sections – Torsion of multi celled thin wall open and closed sections.

Module 4: Plasticity

Introduction to plasticity – General concepts – Stress – Strain curves – Ideal plastic body – Plastic flow conditions – theories of failure – plastic work – Plastic potential – Yield criteria – Simple applications – Elasto – plastic analysis for bending and torsion of bars – Residual stresses.

References:

1. Timoshenko S P and Goodier J. N (1970), "Theory of Elasticity", Tata Mcgraw Hill International Student Edition.
2. Johnson W and Mellor P. B (1966), "Plasticity for mechanical engineers", Van Nostrand Company Ltd.
3. Sadhu Singh (1988), "Theory of elasticity", Khanna Publishers, Delhi.

4. Srinath L. S (1987), “Advanced mechanics of solids”, Tata McGraw– Hill Publishing Company Ltd., New Delhi.

6. Arthur P Boresi & Omar M SideBottom (1992), “Advanced Mechanics of Materials”, John Wiley & Sons.

7. Sokolnikoff (1956), “Mathematical Theory of Elasticity”, MaGraw Hill. Dalley and Rilley, Experimental Stress Analysis.

MCESC104 CONSTRUCTION MANAGEMENT

L	T	P	C
3	1	0	4

Module 1: Scientific Management

Contributions of pioneers in scientific Management - Basic principles of management with special reference to construction industry- construction organization setup.

Module 2: Computer capabilities in management

Methodology and Tools techniques for systematic identification, evaluation, Office and field administrative control reports and records- data processing – Management information systems – Relatedness of MIS with management activities. Management functions and decision making. Concept of balance MIS effectiveness and efficiency criteria. modification of MIS, Simulation of alternatives.

Module 3: Engineering economy

Cash flow- bases of comparison, decision making amongst alternatives- benefit cost analysis- rate of return- replacement analysis – break even analysis. Time value of money, discounted cash flow, Bases of comparison, Incremental analysis, Benefit-Cost analysis, Replacement analysis, Capital budgeting, Working capital management, Construction accounting. Appraisal through financial statements-ratio's analysis, Long term Financing, Practical problems and case studies.

Module 4: Construction planning techniques

Introduction , Work scheduling, Basic steps in PERT/CPM techniques, Network diagram presentation, Rules of drawing network diagram, Fulkerson's rule, Time estimates and Critical path in network analysis, Project evaluation and review technique, Application areas of PERT/CPM techniques– Application of Network Techniques.

References:

1. Bonny J. B. (1973), "Hand book of Construction Management Organization", Van Nostrand Reinhold New York.
2. Robert G Murdick, Joel E. Ros, James and Clegget (2005), "Information systems for Modern Management"- second edition, Prentice Hall of India, New Delhi.
3. Collier, William BG. Ledbetter, "Engineering Cost Analysis"- Courtland A., Harper and Row Publishers, New York.

4. Srinath L. S. (2001), "PERT and CPM –Principles and Applications", 3rd edition Affiliated East- West Press Pvt Ltd., New Delhi

5. Jerome D Wiest and Ferdinand K Levy (1974), "A Management Guide to PERT /CPM with GERT/PDM/DCPM and other networks"- 2nd edition, Prentice Hall of India, Pvt Ltd., New Delhi.

MCESC 105 - 1 **BRIDGE ENGINEERING**

L	T	P	C
3	0	0	3

Module 1: Planning of bridges

Investigation for bridges– need for investigation– selection of site– economical span– subsoil exploration– investigation report– importance for proper investigation–Design of RCC bridges**–** IRC loading– types of bridges– components of bridges– analysis and design of slab bridges and box culvert.

Module 2: Design of girder bridges

T-beam bridges– Analysis and design of deck slab,longitudinal girders and cross girders– Pigeaud's method– Courbon's method– Morice and Little method– Hendry–Jaegar method– prestressed concrete bridges(simply supported case only).

Module 3: Bearings

Importance of bearings– bearings for slab bridges– bearings for girder bridges–Design of elastomeric bearings –Joints –Appurtenances. Substructure- different types- materials for piers and abutments- substructure design– piers and abutments – shallow footings – well foundation.

Module 4: Construction methods

Inspection and maintenance and construction of bridges–case studies of recently constructed major bridges–critical studies of failure of major bridges.

Features of suspension bridges and cable stay bridges.

References:

1. Raina V.K (1991), "Concrete Bridge Practice– Analysis, design & economics", Tata Mc–GrawHill, publishing company, New Delhi.
2. Raina V.K (1988), "Concrete Bridge Practice– Construction Maintenance & Rehabilitation", Tata Mc–GrawHill, publishing company, New Delhi.
3. Victor D.J (19991), "Essentials of Bridge Engineering", Oxford & IBH publishing company, New Delhi.
4. Ponnuswami S (1993), "Bridge Engineering", Tata Mc–GrawHill, publishing company, New Delhi.
5. Krishna Raju N (1996), "Design of Bridges", TataMcGrawHill, publishing company, New Delhi.
6. Relevant IS Codes, and IRC Codes.

MCESC 105 - 2 **DESIGN OF SUBSTRUCTURES**

L	T	P	C
3	0	0	3

Module 1: A. Substructures

Definition and Purpose – Design principles – Design loads – Permissible settlements – Considerations in seismic design of sub structures.

B. Raft Foundations: Types of raft – Bearing capacity and settlement of rafts – Beams on elastic foundation – Methods of design of rafts.

Module 2: Pile Foundations

Load capacity of single piles – Static and dynamic formulae – Pile load tests – Cyclic pile load tests – Laterally loaded piles. Pile groups – Group Efficiency – Design of pile groups – Settlement of single and pile groups in clays and sands – Negative skin friction on single and pile groups.

Module 3: A. Pier Foundations

Types of piers and Uses – Allowable bearing capacity – Design and construction of Piers – Settlement of Piers.

A. Well Foundations: Types – Construction of Wells – Failures and Remedies – Bearing capacity. Design of well foundations – Lateral stability – sinking of wells.

Module 4: Substructures in Expansive soils

Characteristics of Expansive soils – Foundation problems – Foundation alternatives – Methods of Foundations – Design and Construction of under reamed piles

References:

1. J.E.Bowles, “Foundation Analysis and Design”, Mc. Graw Hill Publishing Co., New York
2. Tomlinson, “Pile Design and Construction Practice”, A View Point Publication.
3. Swami Saran (1987), “Design of Substructures”, Oxford & IBH publishers, New Delhi.
4. W.C. Teng (1962), “Foundation Design”, Prentice Hall of India, New Delhi .
5. Ninan P. Kurian – “Modern Foundations”, Tata McGraw Hills Publishing Company.
6. Lamb & Whileman (1969), “Soil Mechanics”, John Wiley & Sons Inc Publishers.

MCESC 105 - 3 ADVANCED CONCRETE TECHNOLOGY

L	T	P	C
3	0	0	3

Module 1: Aggregate

Classification, Testing Aggregates, fibres. Cement, grade of Cement, chemical composition, Hydration of Cement, Structure of hydrated Cement, Special Cement, Water, Chemical and Mineral Admixtures.

Module 2: Principles of Concrete mix design

Methods of Concrete mix design, Design of high strength and high performance concrete. Rheological behaviour of fresh Concrete, Properties of fresh and hardened concrete, Strength, Elastic properties, Creep and Shrinkage, Variability of concrete strength. Non destructive testing and quality control, Durability, corrosion protection and fire resistance.

Module 3: Modern trends in concrete manufacture and placement techniques

Methods of transportataion, Placing and curing–extreme whether concreting, Special concreting methods, Vaccum dewatering of concrete– Under water concreting.

Module 4: Light weight Concrete

Fly–ash Concrete, Fibre reinforced Concrete, Polymer Concrete, Epoxy resins and screeds for rehabilitation – properties and application – Emerging trends in replacement of fine aggregates.

References:

1. Krishnaraju, N., “Advanced Concrete Technology”, CBS Publishers.
2. Nevile, A. M. (1985), “Concrete Technology”, Prentice Hall, New York.
3. Santhakumar A.R (2006), “Concrete Technology”, World Rights Publisher.

MCESC 105 - 4 ADVANCED STEEL STRUCTURES

L	T	P	C
3	0	0	3

Module 1: Design

Design of members subjected to lateral loads and axial loads – Principles of analysis and design of Industrial buildings and bents – Crane gantry girders and crane columns – Bracing of industrial buildings and bents.

Module 2: Analysis and design

Analysis and design of steel towers, trestles and masts – Design of industrial stacks – Self supproting and guyed stacks lined and unlined – Stresses due to wind and earthquake forces – Design of foundations..

Module 3: Introduction

Shape factors – Moment redistribution Static, Kinematic and uniqueness theorems – Combined mechanisms – Analysis Portal frames. Method of plastic moment distribution – Connections, moment resisting connections.

Module 4: Design of light gauge section

Types of cross sections – Local buckling and post buckling – Design of compression and Tension members – Beams – Deflection of beams – Combined stresses and connections. Types of connections, Design of framed beam connections, Seated beam connection, Unstiffened, Stiffened Seat connections, Continuous beam – to – beam connections and continuous beam–to–column connection both welded and bolted

References:

1. Punmia B.C (2000), “Comprehensive Deign of Steel structures”, Laxmi publications Ltd.
2. Arya, A.S. (1982), “Design of Steel Structures”, Newchand & bros, Roorkee.
3. Ram Chandra(1970), “Design of Steel Structures II” , Standard Book House, Delhi,
4. Dayaratnam(2004), “Design of steel structures”.
5. Rajagopalan(1998), “Design of Storage structures”, Tata McGraw Hill.
6. Baker, “Steel skeleton”.
7. S.K.Duggal , “Design of Steel Structures”, McGraw Hill.
8. Lynn S.Beedle, “Plastic Analysis of steel frames”.
9. Relevant IS Codes.
10. Walt Kester, (2004), Analog-Digital Conversion, Analog Devices Inc.

MCESC 106 - 1 ADVANCED CONSTRUCTION TECHNIQUES

L	T	P	C
3	0	0	3

Module 1: Construction techniques

Box Jacking -pipe jacking - Under water cons1ructlon of diaphragm walls and Basement. Tunneling techniques. piling techniques - driving well and caisson -sinking cofferdam - cable anchoring and grouting - driving diaphragm walls sheet piles - laying operations for built up offshore system - shoring for deep - well points - dewatering and stand by plant equipment for underground open excavation - Trenchless Technology.

Module 2: Techniques for concreting

Techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections launching techniques -Slipform techniques- suspended form work -.erection techniques of tall structures - launching techniques for heavy decks -in situ prestressing in high rise structures, aerial transporting handling erecting lightweight components on tall structures - erection of lattice towers and rigging of transmission line structures.

Module 3: Construction sequence and methods

Bow string bridges, cable stayed bridges. launching and pushing of box decks. Construction sequence and methods in domes and prestressed domes. Vacuum dewatering of concrete flooring - concrete paving technology- erection of articulated structures.

Module 4: Construction techniques for foundation

Mud Jacking grout through slab foundation - micro piling for strengthening floor and shallow profile pipeline laying - protecting sheet plies, screw anchors - sub grade water proofing under pinning advanced techniques and sequence in demolition and dismantling.

References:

1. Robertwade Brown, “Practical foundation engineering hand book”, McGraw Hill Publications, 1995
2. Patrick Powers .J, “Construction Dewatering: New Methods and Applications”, John Wiley & Sons, 1992
3. Jerry Irvine, “Advanced Construction Techniques”, CA Rockers, 1984

MCESC 106 - 2 **CONSTRUCTION METHODS AND EQUIPMENTS**

L	T	P	C
3	0	0	3

Module 1: Modern Construction Methods

Open excavation, shafts and tunnels, pile, pier and caisson foundations. Basement construction – construction methods - supporting the excavations – control of ground water - shoring and underpinning – basement waterproofing.

Module 2: Construction Method

Construction Method for: Bridges, roads, railways, dams, harbours, river works and pipelines.

Module 3: Construction equipment and techniques

Construction equipment and techniques for: Earth moving, excavating, drilling, blasting, tunneling and hoisting and erection. Equipment for: Dredging, tunneling, dewatering. Equipment for Flooring-dewatering and floors finishing.

Module 4: Equipment for production of aggregate and concrete

Crushers – feeders – screening equipment – batching and mixing equipment – hauling, pouring and pumping equipment – transporters.

References:

1. Antil J.M., (1982) “Civil Engineering Construction”, McGraw Hill Book Co.
2. Peurifoy, R.L., Ledbette. W.B. (2000), “Construction Planning, Equipment and Methods”, McGraw Hill Co.
3. Ratay, R.T. (1984), “Hand Book of Temporary Structures in Construction”, McGraw Hill.
4. Koerner, R.M. (1984), “Construction & Geotechnical Methods in Foundation Engineering”, McGraw Hill.
5. Varma,M. (1979), “Construction Equipment and its Planning & Applications”, Metropolitain Book Co.
6. Smith, R.C, Andres, C.K. (1986), “Principles and Practive of Heavy Construction”, Prentice Hall.

MCESC 106 - 3 ENERGY CONSERVATION TECHNIQUES IN BUILDING CONSTRUCTION

L	T	P	C
3	0	0	3

Module 1: Fundamentals of energy

Energy Production Systems -Heating. Ventilating and Air. conditioning -Solar Energy and Conservation -Energy Economic Analysis -Energy conservation and audits -Domestic energy consumption -savings- challenges -primary energy use In buildings -Residential. Commercial -Institutional and public Buildings.

Module 2: Energy and resource conservation

Design of green buildings -Evaluation tools for building energy -Embodied and operating energy .Peak demand-Comfort and indoor air quality -Visual and acoustical quality -Land, water and materials -Airborne emissions and waste management..

Module 3: Natural building design consideration

Energy efficient design strategies -Contextual factor -Longevity and process Assessment -Renewable Energy Sources and design -advanced building Technologies. Smart buildings -Economics and cost analysis

Module 4: Energy in building design

Energy efficient and environment friendly building -Thermal phenomena.-thermal comfort- Indoor Air quality -Climate, sun and Solar radiation. Psychometrics -passive heating and cooling systems- Energy Analysis. Active HVAC-systems -Preliminary Investigation -Goals and policies -Energy audit -Types of Energy audit -Analysis of results -Energy flow diagram -Energy consumption /Unit Production- identification of wastage -Priority of conservative measures -Maintenance of energy management program.

References:

1. Moore F. (1994), “Environmental Control system”, Mc Graw Hill, Inc.
2. Brown, GZ Sun (1985), “Wind and Light: Architectural design strategies”, John Wiley.
3. Cook. J Award (1984), “Winning passive Solar Design”, Mc-Graw Hill.

MCESC 106 - 4	QUALITY CONTROL AND SAFETY MANAGEMENT	L	T	P	C
		3	0	0	3

Module 1: Types of organizations

Inspection. control and enforcement -Quality Management Systems and method - Responsibilities and authorities In quality assurances and quality Control- Architects, engineers, contractors, and special consultants, Quality circle.

Module 2: Quality policy

Objectives and methods In Construction Industry -Consumers satisfaction, Economics-Time of Completion -Statistical tolerance -Taguchi's concept of quality -Codes and Standards -Documents -Contract and construction programming -Inspection procedures - Processes and products -Total QA I QC programme and cost implication.

Module 3: Objectives

Regularity agent, owner, design, contract and construction oriented objectives, methods - Techniques and needs of QA/QC -Different aspects of quality - Appraisals, Factors Influencing construction quality.

Critical, major failure aspects and failure mode analysis -Stability methods and tools, optimum design -Reliability testing- reliability coefficient and reliability prediction - Selection of new materials -Influence of drawings detailing, specification, standardization -Bid preparation- Reliability Based Design.

Module 4: Construction activity and environmental safety

Social and environmental factors- Natural causes and speed of Construction -Life cycle costing- Reliability and Probabilistic methods-Value engineering and value analysis

References:

1. Gajski D. D., Abdi S., Gerstlauer A. & Schirner G. (2009), "Embedded System Design: Modeling, Synthesis, Verification", Springer.
2. Peckol & James (2008), "Embedded Systems: A Contemporary Design Tool", John Wiley & Sons.
3. Marwedel P. (2006), "Embedded System Design", Springer.
4. Gerstlauer A., Doemer R., Peng J. & Gajski D. (2001), "System Design: A Practical Guide with SpecC", Kluwer.
5. Groetker T., Liao S., Martin G. & Swan S. (2002), "System Design with SystemC", Kluwer.

6. Vahid F. & Givargis T. (2001), “Embedded System Design: A Unified Hardware / Software Introduction”, John Wiley & Sons.

MCESC 107 **ADVANCED STRUCTURAL ENGINEERING LAB**

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

1. Fabrication, casting and testing of simply supported reinforced concrete beam for strength and deflection behaviour.

2. Testing of simply supported steel beam for strength and deflection behaviour.

3. Fabrication, casting and testing of reinforced concrete column subjected to concentric and eccentric loading.

4. Dynamic testing of cantilever steel beam

   a. To determine the damping coefficients from free vibrations.

   b. To evaluate the mode shapes.

5. Static cyclic testing of single bay two storied steel frames and evaluate

   a. Drift of the frame.

   b. Stiffness of the frame.

   c. Energy dissipation capacity of the frame.

6. Determination of in-situ strength and quality of concrete using

   i) Rebound hammer

   ii)Ultrasonic Pulse Velocity Tester

MCESC 108 **SEMINAR – I**

L	T	P	C
0	0	2	1

Each student shall present a seminar on any topic of interest related to the core / elective courses offered in the first semester of the M. Tech. Programme. He / she shall select the topic based on the references from international journals of repute. They should get the paper approved by the Programme Co-ordinator / Faculty member in charge of the seminar and shall present it in the class. Every student shall participate in the seminar. The students should undertake a detailed study on the topic and submit a report at the end of the semester. Marks will be awarded based on the topic, presentation, participation in the seminar and the report submitted.

MCESC 201 EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

L	T	P	C
3	1	0	4

Module 1: A. Seismic Hazards

Need of special emphasis to earthquake engineering, Ground shaking, structural hazards, Liquefaction, Lateral spreading, Landslides, Life line hazards, Tsunami and Seiche hazards.

B. The Earth And its Interior: - The Circulation, Continental drift, Plate tectonics, Plate boundaries, Faults and its geometry.

C. The Earthquake: - Elastic rebound theory, Terminology like hypocenter, epicenter and related distances.

D. Seismic Waves: - Terminology, Body waves: - P- waves and S- waves, Surface waves: – Love waves and Rayleigh waves. Calculation of wave velocity, measuring instruments, locating epicenter of earthquakes numerically from traces and wave velocity.

E. Earthquake Size: - Intensity – RF, MMI, JMA and MSK. Comparison of above. Magnitude – Local magnitude, Calculation (Analytically and graphically), Limitations, Surface wave magnitudes, Moment magnitudes and its Calculation, Saturation of magnitude scales.

Module 2: A. Earthquake Ground Motion

Parameters: - Amplitude, Frequency and duration. Calculation of duration from traces and energy.

B. Response Spectra: - Concept, Design Spectra and normalized spectra, Attenuation and Earthquake Occurrence. Guttenberg- Richter Law.

C. Concept of Earthquake Resistant Design: - Objectives, Design Philosophy, Limit states, Inertia forces in Structure. Response of Structures – Effect of deformations in structure, Lateral Strength, Stiffness, Damping and ductility.

D. Floor diaphragms: - Flexible and rigid, Effect of inplane and out of plane loading, Numerical example for lateral load distribution

E. Torsion and Twists in Buildings: - Causes, Effects, Centre of mass and rigidity.Torsionally coupled and uncoupled system, Lateral load distribution, Numerical example based on IS code recommendation.

F. Building Configurations: - Size of Building, Horizontal and Vertical layout, Vertical irregularities, Adjacency of Building, Open-ground storey and soft storey, short columns. Effect of shear wall on Buildings. Effect of torsion.

Module 3: A. R.C.C for Earthquake Resistant Structures

How to make buildings ductile, Concept of capacity design, Strong Column weak beam, Soft Storey. Ductile design and detailing of beams and shear walls. Calculation of Base shear and its distribution by using codel provision. Detailing of columns and Beam joints. Performance of R.C.C. Building.

B. Ductile detailing:-Study of IS: 13920-1993.

C. Repair: - Methods, Materials and retrofitting techniques.

Module 4: A. Earthquakes in India

Past earthquakes in India an overview, Behaviour of buildings and structures during past earthquakes and lessons learnt from that.

B. Seismic Code: - Provisions of IS: 1893-2002.

C. Masonry Buildings:- Performance during earthquakes, Methods of improving performance of masonry walls, box action, influence of openings, role of horizontal and vertical bands, rocking of masonry piers.

D. Reduction of Earthquake Effects: - Base Isolation and dampers; Do's and Don'ts During and after Earthquake.

References:

1. Bruce A. Bolt (1993), "Earth quakes", W.H. Freeman and Company, Newyork
2. David A Fanella (2000), "Seismic detailing of Concrete Buildings, Portland Cement" Association, Illinois.
3. Pauly. T and Priestley M.J.N (1997) , "Seismic Design of Reinforced Concrete and Masonry Buildings", John Wiley and sons Inc.
4. Steven L. Kramer (1995), "Geotechnical Earthquake Engineering", Pearson Education.
5. Relevant IS Codes, IS: 1893(Part 1)-2002 and IS : 13920-1993, Bureau of Indian Standards.
6. Pankaj Agarwal and Manish Shrikhande, "Earthquake Resistant Design of Structures", Prentice Hall of India Private Limited, NewDelhi, India.
7. Murthy C. V. R (2002), "Earthquake tips", Building Materials and Technology Promotion Council, NewDelhi, India
8. Anil K Chopra, "Dynamics of Structures, Theory and Applications to Earth Quake Structures".
9. Madhujit Mukhopadhyay (2000), "Vibrations, dynamics and structural systems", Taylor & Francis; Student edition.

MCESC 202 **STRUCTURAL DYNAMICS**

L	T	P	C
3	1	0	4

Module 1: Introduction

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

Module 2: Single Degree of Freedom System– Undamped and damped free and forced vibrations

Critical damping − over damping − under damping − logarithmic decrement .

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.

Module 3: 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.

Module 4: 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 (1990), "Elements of Vibration Analysis", McGraw-Hill Book Company, New York.
3. W.T. Thomson (1993), "Vibration Theory and Applications", Prentice Hall, Simon Schuster Company.
4. M.Mukhopadhyay (1977), "Vibrations, Dynamics & Structural systems", Oxford and IBH, India.
5. Paz Mario , "Structural Dynamics–Theory and Computation"
6. Denhartog, "Mechanical vibrations".
7. Timoshenko S. (2008), "Vibration Problems in Engineering", Second Edition Fifth Printing New York D. Van Nostrand Company.
8. Anil K Chopra (2006), "Dynamics of structures", Pearson Education

MCESC 203 THEORY OF PLATES& SHELLS

L	T	P	C
3	1	0	4

Module 1: A. 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.

B. 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.

Module 2: A. 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.

B. Simply Supported rectangular plates under sinusoidal Load:- Navier solution for simply supported plates subjected to uniformly distributed - Levy's solution for simply supported rectangular plates – uniformly distributed and concentrated load.

Module 3: 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.

Module 4: A. 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.

B. Folded plates – Introduction, Classification, Structural action and analysis.

References:

1. Lloyd Hamilton Donnell (1976), "Beams, plates and shells", Mc Graw Hill, New York.

2. S.P Timoshenko, S.W Krieger (2001), "Theory of plates and shells", Mc Graw Hill, New York.

3. Owen F Hughes (1983), "Ship structural design", John Wiley & Sons, New York.

4. William Muckle (1967), "Strength of ship structures", Edqward Arnold Ltd, London.

5. Gol'oenveizen (1961), "Theory of elastic thin shells", Pergaman press.

6. J Ramachandran (1961), "Thin shell theory and problems", Universities press.

7. Krishna Raju N. (1998), "Advanced Reinforced Concrete Design", CBS Publishers and distributers, New Delhi.

8. G.S Ramaswamy (1968), "Design and Construction of Concrete Shell Roofs", Tata-McGraw Hill Book Co. Ltd.

MCESC 204 PROJECT PLANNING AND IMPLEMENTATION

L	T	P	C
3	1	0	4

Module 1: Project planning

Project reports – sanctions – tendering – contracts – execution of works – measurements – payment – disputes – compensation – arbitration.

Module 2: Work and productivity analysis

Work study – factors influencing productivity – tools to assess productivity – productivity improvement techniques – behavioral science aspects – motivation of individuals – management of groups – leadership – communication.

Module 3: Quality in construction

Planning and control of quality during design of structures – quality standards and codes in design and construction – concept and philosophy of Total Quality Management..

Module 4: Concept of safety in construction

Factors affecting safety – site management with regard top safety recommendations – safety legislation, standards and codes with regard to safety recommendations.

References:

1. Sengupta and H. Guha (1995), "Construction Management and Planning", Tata McGrew Hill Publishing Company Pvt. Ltd., New Delhi.
2. Clarkson Oglesby, Henry Parker (1989), Grogory Howell, "Productivity Improvement in Construction", McGrew Hill Book Company, Inc.

MCESC 205 - 1 **STRUCTURAL STABILITY**

L	T	P	C
3	0	0	3

Module 1: Introduction to stability analysis

Stable, unstable and neutral equilibrium–Stability Criteria. Fourth order Elastica – large deflection of bars differential equation for generalized bending problems–elastic instability of columns–Euler's theory–assumptions–limitations. Energy principles.

Module 2: General treatment of column

Stability problem as an Eigen value problem–various modes of failure for various end conditions– both ends hinged–both ends fixed–one end fixed other end free– one end fixed other end hinged–Energy approach–Rayleigh Ritz–Galarkin's method.

Module 3: Beam column

Beam column equation–solution of differential equation for various lateral loads–udl and concentrated loads– Energy method – solutions for various end conditions–bottom fixed–bottom hinged –horizontal compression members, buckling of frames.

Module 4: A. Stability of plates

Inplane and lateral loads– boundary conditions–critical buckling pressure–aspect ratio–finite difference method– Introduction to torsional buckling, lateral buckling and inelastic buckling.

B. Finite element application to stability analysis

Finite element stability analysis–element stiffness matrix –geometric stiffness matrix–derivation of element stiffness matrix and geometric stiffness matrix for a beam element.

References:

1. Ziegler H (1963), "Principles of structural stability", Blarsdell, Wallham, Mass.

2. Thompson J M, G W Hunt (1973), "General stability of elastic stability", Wiley,New York.

3. Timoshenko S. P., Gere G. M. (1963), "Theory of elastic stability", Mc Graw Hill, New York.

4. Don O Brush, B O O Almorth (1963), "Buckling of Bars, plates and shells", Macmillam, New York.

5. Cox H L (1963), "The buckling of plates and shells", Macmillam, New York.

6. O C Zienkiewicz (1989), “Finite Element Method” ,fourth Edition,McGraw Hill.

7. R.D.Cook (1989), “Concepts and Applications of Finite Element Analysis”, JohnWiley &Sons.

MCESC 205 -2 **PRESTRESSED CONCRETE**

L	T	P	C
3	0	0	3

Module 1: A. Introduction

Basic concept of Prestressing, Analysis of prestress and bending stress: - Stress concept, Strength concept: - Pressure line and internal resisting couple and Load balancing concept for extreme fiber stresses for various tendon profile. Systems of Prestressing: - Pre tensioning and Post tensioning, Thermo elastic and Chemical prestressing. Tensioning devises and Systems, Materials for Prestressed concrete: - Need of high strength concrete and steel, Advantages of prestressed concrete over reinforced concrete.

B. Losses of Prestress: - Losses of Prestress:- Stages of losses,Types of losses in pre-tensioning and post-tensioning due to Elastic shortening, Shrinkage, Creep, Relaxation, Anchorage Slip, Friction and Sudden changes in temperature. Graphical method for friction loss, Methods of overcoming friction losses. Concept of reduction factor.

C. Deflection of beams: - Short term, Load deflection curve, Importance of control of deflections, factors influencing deflections, Pre- cracking and Post- cracking, Effect of tendon profile on deflections, Prediction of long term (Concept only,)

Module 2: A. Cracking and Failure

Micro and visible cracking, Stresses in steel due to loads. Failure: - Flexural failure, Shear failure, other modes of failure.

B. Elastic Design: - Shear and Torsional Resistance of PSC members: - shear and Principal stresses, Ultimate shear resistance of PSC members: - Section cracked and uncracked, Design for shear using IS code. PSC members in torsion:-Pure torsion, Combined bending moment and torsion, Combined bending moment, shear and torsion: - Codified procedures, Design of reinforcement using IS code provision. Flexural strength: - Simplified code procedure for bonded and unbonded symmetrical and unsymmetrical sections. Behavior under flexure: - Codel provision for Limit state design:-Design stress strain curve for concrete. Design of sections for flexure: - Expressions for minimum section modulus, Prestressing force and Eccentricity. Design: - Analytical and Graphical. Limiting zone for prestressing force.

C. End blocks: - Anchorage zone Stresses, Stress distribution in end block, Methods of investigation, Anchorage zone reinforcements, Design (IS Code method only)

Module 3: A. Design of Pretensioned and Post-Tensioned Flexural Members: - Dimensioning of Flexural members, Estimation of Self Weight of Beams, Design of Pre tensioned and Post tensioned members symmetrical about vertical axis.

B. Design of Compression members (Concepts only, no design expected):-Design of compression members, with and without flexure, its application in the design of Piles, Flag masts and similar structures.

C. Prestressing of statically indeterminate structures: - Advantages, Effect, Method of achieving continuity, Primary, Secondary and Resultant moments, Pressure line, Concept of Linear transformation, Guyon's theorem, Concordant cable profile.

Module4: A. Composite construction of Prestressed and in situ Concrete: - Types, Analysis of stresses, Differential shrinkage, Flexural strength, Shear strength, Design of composite section.

B. Tension members: - Load factor, Limit state of cracking, Collapse, Design of sections for axial tension.

C. Design of Special Structures (concept only, no design expected):- Prestressed Folded plates, Cylindrical Shells, Pipes, Circular water tanks.

References:

1. B.Lewicki (1966), "Building with Large Prefabricates", Elsevier Publishing Company, Amsterdam/London/ New York.
2. Koncz. T. (1971), 'Manual of Precast Concrete Construction", Vol. I II and III Bauverlag, GMBH,.
3. Structural Design Manual (1978), "Precast Concrete Connection Details, Society for the studies in the use of Precast Concrete", Netherland Betor Verlag.
4. Lasslo Mokk (1968), "Prefabricated Concrete for Industrial and Public Sectors", Akademiai Kiado, Budapest.
5. Murashev. V., Sigalov. E.,and Bailov. V. (1968), "Design of Reinforced Concrete Structures", Mir Publishers.
6. CBRI, "Building materials and Components", 1990, India.
7. Gerostiza. C.Z., Hendrikson, C., Rehat D. R. (1989), "Knowledge Based Process Planning for Construction and Manufacturing", Academic Press, Inc.

8. Warszawski, A. (1990), “Industrialisation and Robotics in Building – A managerial approach”, Harper & Row.
9. N.Krishnaraju (1985) “Prestressed Concrete”, Tata McGraw-Hill Publishing Company 3rd Ed.
10. T.Y.Lin (1960), “Design of Prestressed Concrete Structures”, John Wiley and Sons.

MCESC 205 - 3 ADVANCED THEORY OF CONCRETE STRUCTURES

L	T	P	C
3	0	0	3

Module 1: Nature of concrete

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

Module 2: 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.

Module 3: Shear cracking

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.

Module 4: 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 (1985), “Limit design of reinforced concrete structures”, Khanna Publishers.

3. A. K Jain , PC Punmia (2009). “Limit State Design of R.C.C Structures” – Laxmi Publications

MCESC 205 - 4 EXPERIMENTAL STRESS ANALYSIS

L	T	P	C
3	0	0	3

Module 1: Strain measurement

Mechanical, optical acoustical strain gauges. Electrical resistance strain gauges, strain rosettes.

Module 2: Measurement of displacements

Potentiometers – linear variable differential transformer (LDVT), Accelero meteres, Measurement of force : Load cells, Electrical resistance based: Ring type force transducer, pressure transducer.

Module 3: Photo elasticity

Light and optics as related to photoelasticity, theory of photo elastic model materials, analysis techniques. Separation and compensation methods. Introduction to 3–dimensional photoelasticity.

Module 4: Methods of measuring sensitivity

Cantilever calibration, determination of ultimate strength, refrigeration techniques, relaxation techniques, double crack analysis of brittle coating data–Introduction to moiré fringe techniques of stress analysis.

References:

1. P.H. Adams & R.C. Dove (1964), "Experimental Stress Analysis and motion Measurement", Merril Charles E., merril Book, Inc., Columbus.
2. M. Hetney, "Hand book of experimental stress analysis"
3. Sadhu Singh (1966), "Experimental Stress Analysis", Khanna Publishers, New Delhi.

MCESC 206 - 1 CONSTRUCTION PLANNING, SCHEDULING AND CONTROL

L	T	P	C
3	0	0	3

Module 1: Basic Concepts In the Development of Construction Plans

Choice of Technology and Construction Method - Defining Work Tasks - Defining Precedence Relationships Among Activities -Estimating Activity Duration. Estimating Resource Requirements for Work Activities -Coding Systems

Module 2: Relevance of Construction Schedules

The Critical Path Method - Calculations for Critical Path Scheduling -Activity Float and Schedules -Presenting Project Schedules Critical Path Scheduling for Activity-on-Node and with Leads. Lags. and Windows . - Calculations for Scheduling with Leads, Lags and Windows - Resource Oriented Scheduling - Scheduling with Resource Constraints and Preceedences - Use of Advanced Scheduling Techniques - Scheduling with Uncertain Duration -Calculations for Monte Carlo Schedule Simulation - Crashing and Time/Cost Tradeoffs - Scheduling In Poorly Structured Problems - Improving the Scheduling Process..

Module 3: The Cost Control Problem

The Project Budget - Forecasting for Activity Cost Control - Financial Accounting Systems and Cost Accounts - Control of Project Cash Flows - Schedule Control - Schedule and Budget Updates - Relating Cost and Schedule Information.

Module 4: Quality and Safety Concerns in Construction

Organizing for Quality and Safety - Work and Material Specifications -Total Quality Control -Quality Control by Statistical Methods - Statistical Quality Control with Sampling by attributes - Statistical Quality Control with Sampling by Variables - Safety.

References:

1. Chitkara. K.K(1998) “Construction Project Management: Planning Scheduling and Control”, Tata McGraw Hill Publishing Company, New Delhi,
2. Calin M. Popescu, Chotchal Charoenngam (1995), “Project Planning, Scheduling and Control in Construction : An Encyclopedia of terms and Applications”, Wiley, New York,

3. Chris Hendrickson and Tung Au(2000), “Project Management for Construction - Fundamental Concepts for Owners, Engineers, Architects and Builders”, Prentice Hall Pittsburgh,
4. Moder, J., C. Phillips and E. Davis (1983) “Project Management with CPM, PERT and Precedence Diagramming”, Van Nostrand Reinhold Company, Third Edition, Willis, E. M., Scheduling Construction Projects
5. John Wiley & Sons, Halpin, D. W (1985). “Financial and Cost Concepts for Construction Management”, John Wiley & Sons. New York.

MCESC 206 - 2 CIVIL ENGINEERING MATERIAL SCIENCE

L	T	P	C
3	0	0	3

Module 1: Introduction

Classification of engineering materials, Atomic structure and bonding, The architecture of solids, Crystal structure, Mechanical properties, Phase transformation, Alloys and their phase diagrams, Equilibrium microstructure of steel alloys, Heat treatment of steel alloys, Stainless steel, Cast iron.

Module 2: Introduction to concrete

Hydraulic cements, Aggregates for concrete, Proportioning of concrete mixes, properties of fresh cement, Microstructure of cement paste, Strength of concrete – Elastic behavior-Shrinkage and creep.

Module 3: Durability of concrete

Physical and chemical causes, Temperature effects in concrete, Environmental impact of concrete, Corrosion of steel reinforcement.

Module 4: Supplementary cementing materials

Silica fume, fly ash, metakaolin, ground granulated blast furnace slag, rice- husk ash etc. Polymers, plastics, rubber and composite materials

.

References:

1. Young. J. F; Mindess, S; Bentuer, “The Science and Technology of Civil Engineering Materials”, Presntice Hall, New York.
2. Ashby, M.F and Jones, D.R.H (2005), “Engineering materials – An Introduction to properties, Applications and design”.
3. Mehta, P.K and Monteiro. P.J.M, “Concrete: Microstructure, properties and materials”

MCESC 206 - 3 **AIR POLLUTION CONTROL**

L	T	P	C
3	0	0	3

Module 1: Sources and effects of pollution

Nature of air pollution problems, nature of pollutants, sources and effects of air pollutants on health, vegetation, materials and atmosphere, green house effect.

Module 2: Meteorology and dispersion of pollutants

Solar radiation and wind circulation, lapse rate, stability conditions of the atmosphere, atmospheric inversions, plume behavior, dispersion of pollutants in the atmosphere, Eddy diffusion model, Gaussian dispersion models.

Module 3: Sampling and analysis of air pollutants

Measurement of gas flows, sampling, instrumentation for measurement of pollutants, concentrations, sampling train for ambient air sampling and stack sampling, particulate gas analysis.

Module 4: A. Engineering control of air pollutions

Control concepts, particulate control devices, control by centrifugal force and gravity, scrubbing, filtration, electrostatic precipitation, control of gases and vapor, adsorption, condensation, combustion, odour control methods, removal of gaseous pollutants (SO_2, H_2S, HF).

B. Air quality standards and legislation- Ambient air quality standards, air quality emission standards, air pollution control legislation.

References:

1. Stern A (1968), "Air pollution", volumes 1,2,3, Academic Press, New York.
2. C.S Rao (1991), "Environmental pollution control engineering", Wiley Eastern Ltd, Delhi
3. M.N Rao & H.V Rao (1990), "Air pollution", Tata Mc Graw Hill Co. Ltd, Delhi.
4. Wayne R. Ott (1998), "Environmental Indices-Theory and Practices", Ann Arbor Science Publishing company. Inc.
5. Chhatwal G.R (1996), "Encyclopedia of Environmental pollution and Control", volumes 1, 2, 3 Anmol Publications.

MAE 206 - 4 ENVIRONMENT AND POLLUTION

L	T	P	C
3	0	0	3

Module 1: Introduction to environment

Components of environment – man and environment

Natural resources – water, land, forest, mineral, energy, food

Module 2: Introduction to environmental pollution

General pollutants; types of pollutants. Pollution – Air, Water, Land, Noise, Thermal, Marine, Pesticide, Radioactive, Plastic Pollution Case studies, Population and the Environment. Environmental ethics, disaster Management.

Module 3: Industrial scenario in India

Industrial activity and Environment - Uses of Water by industry - Sources and types of industrial wastewater - Industrial wastewater and environmental impacts - Regulatory requirements for treatment of industrial wastewater - Industrial waste survey - Industrial wastewater generation rates, characterization and variables - Population equivalent - Toxicity of industrial effluents and Bioassay tests.

Module 4: Prevention Vs Control of Industrial Pollution

Benefits and Barriers - Source reduction techniques - Waste Audit - Evaluation of Pollution prevention options - Environmental statement as a tool for pollution prevention - Waste minimization Circles.

References:

1. P. Aarne Vesilind (1997), “Introduction to Environmental Engineering”, PWS Publishers.
2. Dr. Arumugam & Prof. Kumaresan, “ Environmental Studies”, Saras Publication
3. Surinder Deswal & Dr. Anupama Deswal, “ A Basic Course in Environmental Studies”, Dhanpat Rai and Co (P) Ltd
4. Eckenfelder, W.W. (1999), "Industrial Water Pollution Control", McGraw-Hill.
5. Arceivala, S.J. (1998), "Wastewater Treatment for Pollution Control", Tata McGraw-Hill.
6. Butterworth Heinemann (2001), “Frank Woodard Industrial waste treatment Handbook” , New Delhi.
7. World Bank Group "Pollution Prevention and Abatement Handbook - Towards Cleaner Production', World Bank and UNEP, Washington D.C.1998

8. Paul L. Bishop (2000) "Pollution Prevention: - Fundamentals and Practice", McGraw-Hill International.

MCESC 207 **SOFTWARE LABORATORY**

L	T	P	C
0	0	3	2

Training in the following software & packages

1) Packages related to Construction & Project Management like:

a. STAAD /STRAAP
b. PRIMAVERA / MS PROJECT
c. ANSYS

2) Communication skills like:

a. Audio visual and inter personal
b. Listening skills, show and tell skills and skills to manage difference.
c. Social skills
d. Skills in dealing with selected work groups: clients, construction workers, government inspectors, trade unionists.
e. Skills in understanding the socio-political state of projects and groups

MCESC 208 **SEMINAR – II**

L	T	P	C
0	0	2	1

Each student shall present a seminar on any topic of interest related to the core / elective courses offered in the second semester of the M. Tech. Programme. He / she shall select the topic based on the references from international journals of repute. They should get the paper approved by the Programme Co-ordinator / Faculty member in charge of the seminar and shall present it in the class. Every student shall participate in the seminar. The students should undertake a detailed study on the topic and submit a report at the end of the semester. Marks will be awarded based on the topic, presentation, participation in the seminar and the report submitted.

MCESC 301 **INDUSTRIAL TRAINING**

L	T	P	C
0	0	20	10

The student shall undergo an industrial training of 12 weeks duration in an industry / company approved by the institution under the guidance of a staff member in the concerned field. At the end of the training he / she have to submit a report on the work being carried out.

MCESC 302 **MASTER'S THESIS PHASE - I**

L	T	P	C
0	0	10	5

The thesis (Phase - I) shall consist of research work done by the candidate or a comprehensive and critical review of any recent development in the subject or a detailed report of project work consisting of experimentation / numerical work, design and or development work that the candidate has executed.

In Phase - I of the thesis, it is expected that the student should decide a topic of thesis, which is useful in the field or practical life. It is expected that students should refer national & international journals and proceedings of national & international seminars. Emphasis should be given to the introduction to the topic, literature survey, and scope of the proposed work along with some preliminary work / experimentation carried out on the thesis topic. Student should submit two copies of the Phase - I thesis report covering the content discussed above and highlighting the features of work to be carried out in Phase – II of the thesis. Student should follow standard practice of thesis writing. The candidate will deliver a talk on the topic and the assessment will be made on the basis of the work and talks there on by a panel of internal examiners one of which will be the internal guide. These examiners should give suggestions in writing to the student to be incorporated in the Phase – II of the thesis.

MCESC 401 **MASTER'S THESIS**

L	T	P	C
0	0	30	15

In the fourth semester, the student has to continue the thesis work and after successfully finishing the work, he / she have to submit a detailed thesis report. The work carried out should lead to a publication in a National / International Conference. They should have submitted the paper before M. Tech. evaluation and specific weightage should be given to accepted papers in reputed conferences.

MCESC 402 **MASTER'S COMPREHENSIVE VIVA**

A comprehensive viva-voce examination will be conducted at the end of the fourth semester by an internal examiner and external examiners appointed by the university to assess the candidate's overall knowledge in the respective field of specialization.