Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095

DEPARTMENT OF CIVIL ENGINEERING

M.Tech - Structural Engineering (Full Time)

Curriculum & Syllabus

2018 Regulation

SEMESTER 1						
S.No.	**Sub.Code**	**Subject Name**	**L**	**T**	**P**	**C**
1.	MMA180004	Advanced Engineering Mathematics for Structural Engineering	3	1	0	4
2.	MCE18S001	Theory of Elasticity and Plasticity	3	1	0	4
3.	MCE18S002	Advanced Analysis of Structures	3	1	0	4
4.	MCE18S003	Structural Dynamics	3	1	0	4
5.	MCE18S004	Sustainable Concrete Technology	3	0	0	3
6.	MCE18S005	Prefabricated Structures	3	0	0	3
		Total	**18**	**4**	**0**	**22**

SEMESTER 2						
S.No.	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
1.	MCE18S006	Design of Concrete Structures	3	1	0	4
2.	MCE18S007	Experimental Stress Analysis	3	1	0	4
3.	MCE18S008	Stability of structures	3	1	0	4
4.	MCE18S009	Theory of` Plates and Shells	3	1	0	4
5.	MCE18SEXX	Elective I	3	1	0	4
6.	MCE18SEXX	Elective II	3	0	0	3
7.	MCE18SL01	Structural Engineering – Laboratory	0	0	3	1
		Total	**18**	**5**	**3**	**24**

DEPARTMENT OF CIVIL ENGINEERING

SEMESTER 3						
S.No.	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
1.	MCE18S010	Design of Steel and Pre Engineered Buildings	3	1	0	4
2.	MCE18S011	Aseismic design of structures	3	0	0	3
3.	MCE18SEXX	Elective III	3	0	0	3
4.	MCE18SEXX	Elective IV	3	0	0	3
5.	MCE18SL02	Computer Aided Structural design- Lab	0	0	3	1
6.	MCE18SL03	Project Phase -I	0	0	6	3
		Total	**12**	**1**	**9**	**17**

SEMESTER 4						
S.No.	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
1.	MCE18SL04	Project Phase-II	0	0	24	12
		Total	**0**	**0**	**24**	**12**

TOTAL CREDITS FOR ALL THE SEMESTER = 75

DEPARTMENT OF CIVIL ENGINEERING

LIST OF ELECTIVES (COMMON TO BOTH FT & PT)

S.No	Sub. Code	Subject Name	L	T	P	C
		ELECTIVE I				
1.	MCE18SE01	Prestressed Concrete Structures	3	1	0	4
2.	MCE18SE02	Finite Element Methods in Engineering	3	1	0	4
3.	MCE18SE03	Tall Structures	3	1	0	4
4.	MCE18CE10	Disaster Management	3	1	0	4

S.No	Sub. Code	Subject Name	L	T	P	C
		ELECTIVE II				
5.	MMA18SE01	Optimization Techniques	3	0	0	3
6.	MCE18SE04	Probabilistic Methods in Civil Engineering	3	0	0	3
7.	MCE18SE05	Advanced construction management	3	0	0	3
8.	MCE18SE06	Offshore structures	3	0	0	3

S.No	Sub. Code	Subject Name	L	T	P	C
		ELECTIVE III				
9.	MCE18SE07	Soil Structure Interaction	3	0	0	3
10.	MCE18SE08	Disaster Resistant Structures	3	0	0	3
11.	MCE18SE09	Design of Bridges	3	0	0	3
12.	MCE18SE10	Environmental Engineering Structures	3	0	0	3

S.No	Sub. Code	Subject Name	L	T	P	C
		ELECTIVE IV				
13.	MCE18SE11	Experimental Techniques And Instrumentation	3	0	0	3
14.	MCE18SE12	Pavement Engineering	3	0	0	3
15.	MCE18SE13	Design Concepts of Sub Structures	3	0	0	3
16.	MCE18SE14	Design of Industrial Structures	3	0	0	3

DEPARTMENT OF CIVIL ENGINEERING

MMA180004 ADVANCED ENGINEERING MATHEMATICS FOR STRUCTURAL ENGINEERING 3 1 0 4

UNIT I TRANSFORM METHODS 12 hrs

Laplace Transform methods for one dimensional wave equation – Displacements in a string – Fourier Transform methods – One dimensional heat conduction problems in infinite and semi- infinite rod.

UNIT II CALCULUS OF VARIATIONS 12 hrs

Variation and its properties – Euler's equations – Functionals dependent on First and higher order derivatives – Functionals depend on functions of several independent variables – Problems with moving boundaries – Direct methods – Ritz and Kantorovich methods.

UNIT III ONE DIMENSIONAL RANDOM VARIABLES 12 hrs

Random variables – Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Exponential, and normal distributions – Functions of a Random variable.

UNIT IV TWO DIMENSIONAL RANDOM VARIABLES 12 hrs

Joint distributions – Marginal and conditional distributions – Functions of two dimensional random variables – Correlation – Regression.

UNIT V ESTIMATION THEORY 12 hrs

Unbiased estimators – Method of moments –Maximum likelihood estimation – Curve fitting by Principle of least squares.

Total No. of Hours: 60

REFERENCES :

1 *Sneddon I.N., Elements of Partial Differential Equations, Dover Publications, (2006).*

2 *Sankara Rao K., Introduction to Partial Differential Equations (3rd ed.), PHI, (2010).*

3 *Gupta A.S., Calculus of variations with applications, Prentice Hall of India, (2004).*

4 *Richard Johnson A., Miller & Freund's Probability and statistics for Engineers (8th ed), Prentice Hall of India, (2009).*

5 *Richard Johnson A., Wichern .D.W, Applied Multivariate Statistical Analysis (6th ed), Prentice Hall of India, (2007).*

6 *Gupta S.C., Kapoor V.K., Fundamentals of Mathematical Statistics, S.Chand & Co., (2007).*

7 *Soong T.T., Fundamentals of Probability and Statistics for Engineers, John Wiley & Sons, (2004).*

DEPARTMENT OF CIVIL ENGINEERING

MCE18S001 THEORY OF ELASTICITY AND PLASTICITY 3 1 0 4

OBJECTIVE

- To understand the concept of 3D stress, strain analysis and its Applications to simple problems.

UNIT I: ANALYSIS OF STRESS AND STRAIN 12Hrs

Analysis of stress and strain, stress strain relationship. Generalized Hook's law. Plane stress and plane strain.

UNIT II: 2D PROBLEMS 12 Hrs

Two-dimensional problems in Cartesian and polar co-ordinates for simple problems.

UNIT III: TORSION 12 Hrs

Torsion of non-circular section - methods of analysis - membrane analogy – torsion of thin rectangular section and hollow thin walled sections.

UNIT IV: ENERGY METHODS 12 Hrs

Energy methods - principle of virtual work - energy theorem - Rayleigh Ritz methods - Finite Difference method.

UNIT V: INTRODUCTION TO PROBLEMS IN PLASTICITY 12 Hrs

Physical assumption - criterian of yielding, yield surface, Flow rule (plastic stress strain relationship). Elastic plastic problems of beams in bending - plastic torsion.

Total No of Hours: 60

REFERENCES

1. *Timoshenko, S. and Goodier T.N. "Theory of Elasticity", McGraw Hill Book Co., Newyork, II Edition 1988.*
2. *Chwo P.C. and Pagano, N.J. "Elasticity Tensor, Dyadic and Engineering applications", D.Van Nestrand Co., In Co., 1967.*
3. *Chenn, W.P. and Henry D.J. "Plasticity for Structural Engineers", Springer Verlag Newyork 1988.*
4. *Sadhu Singh, "Theory of Elasticity", Khanna Publishers, New Delhi 1988.*
5. *Verma, PDS, "Theory of Elasticity", Vikas Publishing Pvt. Ltd. New Delhi -1997.*
6. *Sadhu Singh, "Theory of Plasticity", Khanna Publishers, New Delhi 1988.*

DEPARTMENT OF CIVIL ENGINEERING

MCE18S002 ADVANCED ANALYSIS OF STRUCTURES 3 1 0 4

OBJECTIVE

- To understand the concept of matrix methods and computer application Matrix methods

UNIT I: INTRODUCTION 12 Hrs

Introduction to matrix methods of analysis - statically indeterminacy and kinematics indeterminacy - degree of freedom - coordinate system - structure idealization stiffness and flexibility matrices - suitability element stiffness equations - elements flexibility equations - mixed force - displacement equations - for truss element, beam element and tensional element. Transformation of coordinates - element stiffness matrix - and load vector - local and global coordinates

UNIT II: FLEXIBILITY METHOD 12 Hrs

Matrix flexibility methods - general formulation - application to plane rigid frames - plane trusses.

UNIT III: STIFFNESS METHOD 12 Hrs

Direct Stiffness method and application to 3-D frames and trusses, and grids (with three members only

UNIT IV: COMPUTER APPLICATION 12 Hrs

Computer Applications and use of Computer packages - Programming techniques and problems.

UNIT V: ANALYSIS BY SUBSTRUCTURE TECHNIQUE 12 Hrs

A special analysis procedure - static condensation and sub structuring - initial and thermal stresses. Shear walls-Necessity - structural behaviour of large frames with and without shear walls - approximate methods of analysis of shear walls.

|Total No of Hours: 60

TEXT BOOKS

1. Rajasekharan S. and Sankarasubramainian G., "Computational Structural Mechanics", Prentice Hall, India,
   2001.
2. Manikaselvam – Elements of Matrix Analysis and Elastic Stability, Khanna Publishers, New Delhi Sixth Edition-2009.
3. Negi, "Structural Analysis" , Tata Mc Graw Hill Publishing Company 2007.

REFERENCES

1. *Coates, R.C., Coutie. M.G., and Kong, F.K., Structural Analysis ,John Wiley and Sons, 1979.*
2. *McGuire, W., and Gallagher, R.H., Matrix Structural Analysis , John Wiley and Sons, 1979.*
3. *John L.Meek., Matrix Structural Analysis , Mc Graw Hill Book Company, 1971.*

DEPARTMENT OF CIVIL ENGINEERING

MCE18S003 STRUCTURAL DYNAMICS 3 1 0 4

OBJECTIVE

- To expose the students the principles and methods of dynamic analysis of structures and to prepare them for designing the structures for wind, earthquake and other dynamic loads.

UNIT I : PRINCIPLES OF DYNAMICS 15 Hrs

Formulation of equations of motion by different methods, single degree of freedom systems, free and forced response, effect of damping.

UNIT II: MULTIDEGREE OF FREEDOM SYSTEMS 15 Hrs

Formulation of structure property matrices, Eigen values problems, Modes shapes and ortho normality of modes, approximate methods of extraction of Eigen values.

UNIT III: DYNAMIC RESPONSE OF MDOF SYSTEMS 10 Hrs

Mode superposition techniques, Numerical integration procedures.

UNIT IV: CONTINUOUS SYSTEMS 10 Hrs

Modeling - free and forced vibration of bars and beams.

UNIT V: APPLICATIONS 10 Hrs

Idealization of structures to mathematical models, examples of wind, earthquake and impact.

Total No of Hours: 60

TEXT BOOK

1. Roy R.Craig, Jr., Structural Dynamics - An Introduction to computer methods , John Wiley & Sons, Los Angeles.1981.

***Note: (Use of approved data books permitted)**

REFERENCES

1. *Clough R.W and Penzien,J., Dynamics of Structures , Mc Graw Hill, New Delhi 1975.*
2. *Paz Mario, Structural Dynamics, Academic Press, Los Angeles 1985.*
3. *Anderson R.A., Fundamentals of vibration, Amerind Publishing Co. New Delhi, 1972.*

DEPARTMENT OF CIVIL ENGINEERING

MCE18S004 SUSTAINABLE CONCRETE TECHNOLOGY 3 0 0 3

OBJECTIVE

- To study the properties of materials, tests and mix design for concrete.

UNIT I : CEMENTS AND ADMIXTURES 9 Hrs

Portland cement – Chemical composition - Hydration, setting and finenesses of cement – structures of hydrated cement – mechanical strength of cement gel - water held in hydrate cement paste – Heat of hydration of cement – Influence of compound composition on properties of cement – tests on physical properties of cement – I.S. specifications – Different types of cements – Admixtures.

UNIT II: CONCRETE 9 Hrs

Properties of fresh concrete, Hardened concrete, Strength, Elastic properties, Creep and shrinkage, Variability of concrete strength.

UNIT III: MIX DESIGN 9 Hrs

Principles of concrete mix design, Methods of concrete mix design, Testing of concrete.

UNIT IV: SPECIAL CONCRETE 9 Hrs

Light weight concrete, Fly ash concrete, Fibre reinforced concrete, Polymer Concrete, Super plasticised concrete, Epoxy resins and screeds for rehabilitation - Properties and Applications - High performance concrete.

UNIT V: WASTE MATERIALS 9 Hrs

Waste materials used in concrete structures, E- Waste – Solid hazardous waste – Plastics – GGBS – Fly Ash – Rice husk ash - Quarry dust.

Total No of Hours: 45

REFERENCES

1. *Neville, A.M., Properties of Concrete , Pitman Publishing Limited, London.*
2. *Shetty M.S., Concrete Technology, S.Chand and Company Ltd. Delhi.*
3. *Rudhani G., Light Weight Concrete Academic Kiado, Publishing Home of Hungarian Academy of Sciences, New Delhi 1963.*
4. *SanthaKumar A.R.Oxford press.*

DEPARTMENT OF CIVIL ENGINEERING

MCE18S005 PREFABRICATED STRUCTURES 3 0 0 3

OBJECTIVE

- To Study the design principles, analysis and design of elements.

UNIT I: INTRODUCTION 9 Hrs

Concept of planning and layout of prefabricated plant. IS Code specification. Modular co-ordination, standardization, production, transportation, erection, stages of loading and coal provisions, safety factors, material properties, Deflection control, Lateral load resistance, Location and types of shear walls.

UNIT II: REINFORCED CONCRETE 9 Hrs

Prefabricated structures - Long wall and cross-wall large panel buildings, one way and two way prefabricated slabs, Framed buildings with partial and curtain walls

UNIT III: FLOORS, STAIRS AND ROOFS 9 Hrs

Types of floor slabs, analysis and design example of cored and panel types and two-way systems, staircase slab design, types of roof slabs and insulation requirements, Description of joints

UNIT IV: WALLS 9 Hrs

Types of wall panels, Blocks and large panels, Curtain, Partition and load bearing walls, types of wall joints, Leak
prevention, joint sealants, sandwich wall panels.

UNIT V: ACCESSORIES AND PLUMPING 9 Hrs

Folded plate and hyper-prefabricated shells, Erection and jointing, joint design, Water leakage, damp proofing

Total No of Hours: 45

***Note: (Use of approved data books permitted)**

REFERENCES

1. *B.Lewicki, Building with Large Prefabricates, Elsevier Publishing Company, Amsterdam/ London/ New York, 1966.*
2. *Koncz.T., Manual of Precast Concrete Construction, Vol.I II and III, Bauverlag, GMBH, 1971.*
3. *Structural Design Manual, Precast Concrete Connection Details, Society for the Studies in the use of Precase Concrete, Netherland Betor Verlag, London 1978.*
4. *Lasslo Mokk, Prefabricated Concrete for Industrial and Public Sectors, Akademiai Kiado, Budapest, 1964.*
5. *Murashev.V., Sigalov.E., and Bailov.V., Design of Reinforced Concrete Structures, Mir Publishers, London 1968.*
6. *CBRI, Building Materials and Components, 1990, India.*
7. *Gerostiza. C.Z., Hendrikson, C., Rehat D.R., Knowledge Based Process Planning for Construction and Manufacturing, Academic Press, Inc., London 1989.*
8. *Warszawski, A., Industrialization and Robotics in Building - A managerial approach, Harper & Row, London 1990.*
9. *ICI, CPWD handbook.*

DEPARTMENT OF CIVIL ENGINEERING

MCE18S006 DESIGN OF CONCRETE STRUCTURES 3 1 0 4

OBJECTIVE

- To study the behaviour, analysis and design of R.C. structures.

UNIT I: OVERALL REVIEW 14 Hrs

Review of limit state design of beams - Slabs and columns according to IS 456-2000 - Calculation of deflection and crack width according to IS 456-2000.

UNIT II: DESIGN OF SPECIAL RC ELEMENTS 11 Hrs

Design of Slender columns - Design of R.C walls - Ordinary and shear walls - Design of Corbels - Deep – beams and grid floors.

UNIT III: FLAT SLABS AND FLAT PLATES 10 Hrs

Design of flat slabs and flat plates according to ACI method - Design of shear load - reinforcement and edge(spandrel) beams - Yield line theory and Hillerberg method of design of slabs.

UNIT IV: INELASTIC BEHAVIOUR OF CONCRETE BEAMS 15 Hrs

Inelastic behavior of concrete beams - moment - rotation curves - moment redistribution - Baker's method of plastic design - Design of cast-in-situ joints in frames.

UNIT V: GENERAL 10 Hrs

Detailing for ductility - fire resistance of buildings - field control of concrete**.**

Total No of Hours: 60

TEXT BOOKS

1. Purushothaman, P, Reinforced Concrete Structure Structural Elements: Behaviour Analysis and Design , Tata Mc Graw Hill, New Delhi 1986.
2. Varghese, P.C., Limit State Design of Reinforced Concrete, Prentice Hall of India New Delhi, 1995.
3. Krishna Raju, N.Advanced Reinforced Concrete Design, CBS Publishers and New Delhi Distributors, 1986.

DEPARTMENT OF CIVIL ENGINEERING

MCE18S007 EXPERIMENTAL STRESS ANALYSIS 3 1 0 4

OBJECTIVE

- To learn the principles of measurements of static and dynamic response of Structures and carryout the analysis of results.

UNIT I: STRAIN GUAGES **10** Hrs

Mechanical, optical and acoustic gauges, description and operation of gauges, electrical resistance strain gauges, types of gauges, static and dynamic strains, strain rosette, calibration of gauges and circuit theory – Effect of transverses strain recorders and loads cells.

UNIT II: MODEL ANALYSIS **10 Hrs**

Structural similitude, use of models, model analysis, structural and dimensional analysis, Buckingham Pi theorem, applications, Muller Breslau principle for indirect model analysis, use of Begg's Eney's and R.P.I. deformeters and moment indicator, design of models for direct and indirect analysis.

UNIT III: PHOTOELASTICITY **10 Hrs**

Introduction of photoelasticity; polariscope, compensators, models materials, calibration of photoelastic materials Isochromatic and Isoclinic Fringes, stress determination, time – Edge effects, three dimensional photoelasticity, freezing techniques. Moiré fringe technique, Grid methods – Holography and interferometry use of X-ray and laser beams in stress analysis – Elementary ideas.

UNIT IV: ANALOGIES **10 Hrs**

Membrane analogy for torsion and flexure, sand heap analogy, hydrodynamic and electrical analogies.

UNITV: MISCELLANEOUS METHODS **20 Hrs**

Brittle acquer techniques, linear transducers, accelerometers, choice of experimental methods, model loadings, basic standards and accuracy of measurements , Introduction Of Dynamic Analysis- (Non – destructive testing, ultrasonic and sonic testers, flaw detectors).

Total No of Hours: 60

REFERENCES

1. *Dr. T.P. Ganesan, "Model analysis of Structures', Universities Press Hyderabad, 2000.*
2. *Dove, R.C. and Adams, P.H., Experimental stress Analysis and Motion measurement. Prentice Hall of India (Private Ltd., New Delhi) 1965.*
3. *Dally, J.W. and Riley, W.F. Experimental Stress Analysis, McGraw Hill, 2nd Edn. New York, 1978.*
4. *Heteryi (ed) Handbook of experimental stress analysis, John Wiley and sons, New york, 1950.Coker, E.G. and Filon, L.N.G. A treatise on Photoelasticity, Cambridge Press, 2nd Edn., Revised by H.T.Jesop, London, 1957.*
5. *Forcht, M.M. Photoelasticity, Vol.I and Vol.II John Wiley and sons, Newyork, 1941.*
6. *Durelli, A.J. Applied Stress Analysis, Prentice Hall, New Jersey, 1967.*

DEPARTMENT OF CIVIL ENGINEERING

MCE18S008 STABILITY OF STRUCTURES 3 1 0 4

OBJECTIVE

- To study the concept of buckling and analysis of structural elements.

UNIT I: INTRODUCTION 15 Hrs

Concept of stability approaches to stability analysis, characteristics of stability problems, Columns - Buckling of columns with various end conditions, imperfect columns, Elastically supported columns, non-prismatic columns, Built-up columns, Inelastic buckling, Experimental study of column behavior, Empirical column formulae. Buckling of bars on elastic foundations, Large deflection of buckled bars.

UNIT II: BEAMS – COLUMNS 8 Hrs

Beam-column theory, Application to buckling of frames.

UNIT III: TORSIONAL BUCKLING 14 Hrs

Combined tensional and flexural buckling. Lateral Buckling - Lateral buckling of beams, pure bending of simply supported beam and cantilever, numerical solutions.

UNIT IV: PLATES 8 Hrs

Buckling of thin plates, various edge conditions, inelastic buckling, post buckling strength.

UNIT V: APPROXIMATE METHODS 15 Hrs

Energy methods, Iterative procedure and Finite element formulation.

Total No of Hours: 60

REFERENCES

1. *Allen, H.G., and Bulson, P.S., Background to Buckling, McGraw Hill Book Company, New Delhi 1980.*
2. *Smitses, Elastic Stability of Structures, Prentice Hall, New Delhi 1973.*
3. *Timoshenko, S., and Gere., Theory of Elastic Stability, McGraw Hill Book Company, New Delhi 1961.*
4. *Brush and Almorth.,Buckling of Bars, Plates and Shells, McGraw Hill Book Company, New Delhi 1975.*
5. *Chajes, A. Principles of Structures Stability Theory, Prentice Hall, New Delhi 1974.*
6. *Ashwini Kumar, Stability Theory of Structures, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1985.*

DEPARTMENT OF CIVIL ENGINEERING

MCE18S009 THEORY OF PLATES AND SHELLS 3 1 0 4

OBJECTIVES

- To study the behaviour and analysis of thin plates and the behaviour of anisotropic and thick plates.
- Study the behaviour and design of shells, design of plates.

UNIT I BENDING OF RECTANGULAR PLATES 8 Hrs

Bending of plate to cylindrical surface long uniformly loaded plates – Rectangular plates – Differential equations of laterally loaded plates – Navier's and Levy's solutions – Pure bending in two perpendicular directions.

UNIT II BENDING OF CIRCULAR PLATES 7 Hrs

Circular plates – Clamped and simply supported – bending of concentrically loaded circular plates. Analysis of stress and deformation of plates bent by transverse loads – plates on elastic supports – Energy methods and approximate methods of solution.

UNIT III CLASSIFICATION OF SHELLS 15 Hrs

Synclastic – Anticlastic – Singly and Doubly curved – Translation and revolution.

UNIT IV MEMBRANE THEORY 15 Hrs

Analysis of singly and doubly shells – Applications of elliptic paraboloid and hyperbolic paraboloid shells – Analysis of shells of evolutions like conical and circular domes.

UNIT V FLEXURE THEORY 15 Hrs

Shells of revolution – edge disturbance – problems of symmetrically loaded spherical shells – Cylindrical tanks with uniform wall thickness – Circular cylindrical shell roof – Dischinger and Finster Waalder theories – Application of numerical methods of shells.

Total No of Hours: 60

REFERENCES

1. *Flugge, Stresses in shells, 2nd ed., Springer – Verglag, Berlin, 1960*
2. *Sziland, R. Theory and Analysis of Plates (Classical and Numerical Methods) Prentice Hall, Ijc. New Jersy, 1974.*
3. *Billington, D.P. Thin Shell concrete structures 2nd ed. McGraw Hill Book Co., New York, 1965.*
4. *Ugural, Il. Theory and practice of shell structures, Wilhelm Ernst and John Berlin, 1968.*
5. *Timoshenko.S and Krieger.S.W., Theory of Plates and Shells, McGraw Hill Co., New York 1990.*

DEPARTMENT OF CIVIL ENGINEERING

MCE18SL01 STRUCTURAL ENGINEERING – LABORATORY 0 0 3 1

OBJECTIVE

- Students should get good knowledge about various tests conducted for concrete.

1. Tests on Cement -Consistency, Setting Times, Soundness, Compressive Strength.
2. Workability Test on Fresh Concrete
3. "E" value for concrete.
4. Casting of Reinforced concrete beams for conducting flexure and shear tests.
5. Bending test on steel flat
6. Testing of various types of reinforcement using mechanical and electrical strain gauges.
7. Permeability of Concrete.
   a. Rapid chloride Penetration Test,
   b. Freeze and Thaw test,
   c. Acid test ,
   d. Alkali aggregate reaction test
   e. VCC testing fire resistance
   g. Autoclaving
8. Non Destructive Testing Of Concrete.
   a. Ultra Sonic Pulse velocity Test,
   b. Rebound Hammer test
   c. Cover Meter
   d. Rebar Locator
   e. Concrete Analyzer

Total No of Hours: 30

REFERENCES

1. *Purushothaman, P, Reinforced Concrete Structure Structural Elements : Behaviour Analysis and Design , Tata Mc Graw Hill, New Delhi 1986.*
2. *Varghese, P.C., Limit State Design of Reinforced Concrete, Prentice Hall of India New Delhi, 1995.*
3. *Krishna Raju, N.Advanced Reinforced Concrete Design, CBS Publishers and New Delhi Distributors, 1986.*
4. *Neville, A.M., Properties of Concrete , Pitman Publishing Limited, London.*
5. *Shetty M.S., Concrete Technology, S.Chand and Company Ltd. Delhi.*

DEPARTMENT OF CIVIL ENGINEERING

MCE18S010 DESIGN OF STEEL AND PRE ENGINEERED BULIDINGS 3 1 0 4

OBJECTIVES

To study the behaviour of members and connections, analysis and design of steel towers, chimneys. Study the design of with cold formed steel and plastic analysis of structures.

UNIT I GENERAL AND DESIGN OF CONNECTIONS 12 Hrs

Design of members subjected to lateral loads and axial loads - Types of connections - Design framed beam connections - Seated beam connections – Un-stiffened, Stiffened seat connections, Continuous beam-to-beam connections and continuous beam-to-column connection both welded riveted.

UNIT II PLASTIC ANALYSIS OF STRUCTURES 12 Hrs

Introduction - Shape factor - Moment redistribution - Static, Kinematic and Uniqueness theorems – Combined mechanism - Analysis of single bay and two bay portal frames - Methods of plastic moment distribution – Effect of axial force and shear force on plastic moments - Connections Moment resisting connection - Design of continuous beams.

UNIT III DESIGN OF LIGHT GAUGE STEEL STRUCTURES 12 Hrs

Types of cross sections - local bucking and lateral bucking - concepts of Effective width - Design of compression and tension members, Beams, Deflection of beams and design of beam webs. Combined stresses and connections, wall studs.

UNIT IV ANALYSIS AND DESIGN OF INDUSTRIAL BUILDINGS & SPECIAL STRUCTURES 12 Hrs

Analysis and Design of industrial buildings and bents - Sway and non-sway frames - Design of Purlins, Louver rails, Gable column and Gable wind girder –Analysis of Gable Frames check for deflection.

UNIT V INTRODUCTION TO PRE-ENGINEERED BUILDINGS 12 Hrs

Standard design loads – Advantages of pre engineered buildings - Framing systems for Pre Engineered steel buildings – Characteristics of Pre Engineered steel buildings – Erection concepts of primary and secondary structural framing systems – Installation - Repairing common metal building problems and failures

Total No of Hours: 60

***Note: (Use of approved data books permitted)**

REFERENCES

1. *Horne, M.R., and Morris, L.J., Plastic Design of Low -rise frames, Granada Publishing Ltd.,UK 1981.*
2. *Salmon, C.G., and Johnson, J.E. Steel Structure -Design and Behaviour, Harper and Row, UK 1980.*
3. *Dayarathnam, P., Design of Steel Structure, A.H.Wheeler, UK 1990.*
4. *Kuzamanovic,B.O. and Willems,N., Steel Design for Structural Engineers, Prentice Hall, New Delhi 1977.*
5. *Wie - Wen Yu., Cold-formed Steel Structures, McGraw Hill Book Company, New Delhi 1973.*
6. *William McGuire, Steel Structures, Prentice Hall, Inc., Englewood Cliffs, New BINSDAG, 'Teaching Resource for Structural Steel Design', Kolkata, Version-II*
7. *IS: 6533: Part 1- 1989 Code of Practice for Design and Construction of steel chimney.*
8. *IS 802 : Part 1 : Sec 1 : 1995 Code of practice for use of structural steel in overhead transmission line towers, Part 1 Materials and Loads and permissible stresses Section 1 Materials and Loads*
9. *IS 6533: Part 2-1989 Code of practice for design and construction of steel chimneys Part 2 Structural aspects.*
10. *Jonathan T. Ricketts, Building Design and Construction Handbook, Tata Mc Graw Hill, 6th edition, 2000.*
11. *Kirby building systems, Technical handbook for Pre Engineered buildings.*

DEPARTMENT OF CIVIL ENGINEERING

MCE18S011 ASEISMIC DESIGN OF STRUCTURES 3 0 0 3

OBJECTIVE

- explain behavior of structures subjected to earthquake
- utilize various IS codal provisions for seismic design
- design RC shear walls frame system
- perform Retrofitting and Rehabilitation for existing damaged buildings

UNIT I INTRODUCTION 9 Hrs

Basic Seismology – General features of Tectonics of Seismic Regions- Earthquake Terminology - Definitions -Earthquake History – Behaviour of Buildings, Dams and Bridges in Earthquakes – Seismographs – Accelerographs – Theory of Vibrations – Damped and undamped system – free and forced vibrations – SDOF and MDOF systems

UNIT II EARTHQUAKE RESPONSE 9 Hrs

Earthquake Response to Elastic and Inelastic Buildings – Application to Response Spectrum Theory – base exited motion - ground motion parameters – Modal response contribution – modal participation factor – response history – spectral analysis – multiple support excitation – earthquake response to continuous systems on rigid base

UNIT III IS CODE PROVISIONS & SEISMIC DESIGN 9 Hrs

Design Criteria Strength, Deflection, Ductility and Energy Absorption – Cyclic Behaviour of PCC,RCC, Steel and PSC Elements- Codal Provisions of Design of Buildings As Per IS 1893 And IS 4326. Ductile Detailing of Structures As Per IS 13920. Behaviour and Design of Masonry Structures as Per IS 13827 and IS13828. Methods of Seismic Analysis: Equivalent static analysis – RS method – Time history method – Pushover Analysis – Mathematical modeling of multistoried RC building.

UNIT IV BEHAVIOUR OF RC STRUCTURES 9 Hrs

Analysis and Design of Frames for Lateral Loads – Capacity Design – Strong column weak Beam concept- Beam column joints– Shear Wall Frame System – Coupled Shear Wall – Design of Rectangular and Flanged Shear Walls – Ductile Detailing of Frames for Earthquake Forces - Strengthening of Existing Buildings – Retrofitting and Rehabilitation.- Liquefaction of soil

UNIT V MODERN TOPICS 9 Hrs

Modern Concepts – Base Isolation, Passive Control and Active Control Systems – Computer Analysis and Design of Buildings for Earthquake Loads using Software Packages like ANSYS, SAP2000, STRAP AND STUDS.

Total No of Hours: 45 Hrs

***Note: (Use of approved data books permitted)**

REFERENCES

1.Pankaj Agarwal, 'Earthquake Resistant Design of Structures', Prentice – Hall of India pvt.ltd., New Delhi,2002.

***2.** Anil K. Chopra, 'Dynamics of Structures – Theory and applications to Earthquake Engineering', Prentice – Hall of India pvt.ltd., New Delhi,2002.*

3. Ambrose &Vergun, ' Simplified Building Design for wind and Earthquake Forces', John Wiley, 1985

4. Berg, 'Seismic, Design Codes and Procedures, Earthquake Engineering Research Institute, Oakland, California, USA.

5. Newmark&Rosenbluenth, 'Fundamentals of Earthquake Engineering', Prentice Hall, 1971.

6. Rosenblueth (Ed.), 'Design of Earthquake Resistance Structures', Prentech Press, London, 1980.

7. Arya,A.S., et.al., 'Earthquake Engineering' SaritaPrakasham, Meerut.

DEPARTMENT OF CIVIL ENGINEERING

MCE18SL02 COMPUTER AIDED STRUCTURAL DESIGN-LAB 0 0 3 1

OBJECTIVE

- Student should aware of computer application of structural design.

1. Program Using Arrays and Functions for Matrix Manipulation.
2. Programs to Draw Bending Moment and Shear Force Diagrams. Using Graphic in C
3. Program for Design of Slabs. Using Excel
4. Program for Design of Beams. Using Excel
5. Program for Design of Column and Footing Using Excel
6. Analysis of Truss Using STAAD Pro.
7. Analysis of Multistoried Space Frame, Using STAAD Pro.
8. Analysis of Bridge Deck Slab.

Total No of Hours: 30

TEXT BOOKS/REFERENCES:

1. Computer Aided Design by C.S.Krishnamoorthy and S.Rajeev.
2. Computational Structures by S.Rajasekharan.

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MCE18SL03 **PROJECT PHASE I** **0 0 6 3**

OBJECTIVE

- The student shall be capable of identifying a problem related to the program of study and carry out wholesome research on it leading to findings which will facilitate development of a new/improved product, process for the benefit of the society.

M.Tech projects should be socially relevant and research oriented ones. Each student is expected to do an individual project. The project work is carried out in two phases – Phase I in III semester and Phase II in IV semester. Phase II of the project work shall be in continuation of Phase I only. At the completion of a project the student will submit a project report, which will be evaluated (end semester assessment) by duly appointed examiner(s). This evaluation will be based on the project report and a viva voce examination on the project. Student will be allowed to appear in the final viva voce examination only if he / she has submitted his / her project work in the form of paper for presentation / publication in a conference / journal and produced the proof of acknowledgement of receipt of

DEPARTMENT OF CIVIL ENGINEERING

MCE18SL04 **PROJECT PHASE II** **0 0 24 12**

OBJECTIVE

- The student shall be capable of identifying a problem related to the program of study and carry out wholesome research on it leading to findings which will facilitate development of a new/improved product, process for the benefit of the society.

M.Tech projects should be socially relevant and research oriented ones. Each student is expected to do an individual project. The project work is carried out in two phases – Phase I in III semester and Phase II in IV semester. Phase II of the project work shall be in continuation of Phase I only. At the completion of a project the student will submit a project report, which will be evaluated (end semester assessment) by duly appointed examiner(s). This evaluation will be based on the project report and a viva voce examination on the project. Student will be allowed to appear in the final viva voce examination only if he / she has submitted his / her project work in the form of paper for presentation / publication in a conference / journal and produced the proof of acknowledgement of receipt of

Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
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DEPARTMENT OF CIVIL ENGINEERING

ELECTIVE SYLLABUS

DEPARTMENT OF CIVIL ENGINEERING

MCE18SE01 PRESTRESSED CONCRETE STRUCTURES 3 1 0 4

OBJECTIVE

- Principle of prestressing, analysis and design of prestressed concrete structures.

UNIT I DESIGN PRINCIPLES FOR FLEXURE SHEAR BOND AND END BLOCKS INTRODUCTION AND CODAL PROVISIONS 12Hrs

Principles of Prestressing - types and systems of prestressing, need for High Strength materials, Analysis methods losses, deflection (short-long term), camber, cable layouts. Behaviour under flexure - codal provisions (IS, British ACI), ultimate strength. Design of flexural members,

UNIT II DESIGN OF COMPRESSION MEMBERS 12Hrs

Design for Shear, bond and torsion. Design of End blocks and their importance Design of tension members - application in the design of prestressed pipes and prestressed concrete cylindrical water tanks. Design of compression members with and without flexure - its application in the design piles, flagmasts and similar structures.

UNIT III COMPOSITE BEAMS 12Hrs

Composite beams - analysis and design, ultimate strength - their applications. Partial prestressing - its advantages and applications.

UNIT IV CONTINUOUS BEAMS 12Hrs

Application of prestressing in continuous beams, concept of linear transformation, concordant cable profile and cap cables.

UNIT V DESIGN OF SPECIAL STRUCTURES 12Hrs

Special structures like prestressed folded plates, prestressed cylindrical shells, prestressed concrete poles.

Total No of Hours: 60

TEXT BOOKS

1. Prestressed Concrete by Krishna Raju, Tata McGraw Hill Publishing Co. 5th edition, 2012
2. Fundamentals of Prestressed Concrete by N.C.Sinha & S.K.Roy S.Chand & Co.,New Delhi 2011.

REFERENCES

1. *T.Y.Lin, Design of Prestressed Concrete Structures, John Wiley and Sons, Inc Berlin, 3rd edition, 1981.*
2. *Leonhardt.F., Prestressed Concrete, Design and Construction, Wilhelm Ernst and Shon, Berlin, 2nd edition, 1964.*

DEPARTMENT OF CIVIL ENGINEERING

MCE18SE02 FINITE ELEMENT METHODS IN ENGINEERING 3 1 0 4

OBJECTIVES

- To study the energy principles, finite element concept.
- Stress analysis, meshing.
- Nonlinear problems and applications.

UNIT I INTRODUCTION 12 Hrs

Boundary Value Problem - Approximate Solution - Variation and Weighted Residual Methods - Ritz and Gale kin Formulations - Concepts of Piecewise Approximation and Finite Elements - Displacement and Shape Functions - Weak Formulation - Minimum Potential Energy - Generation of Stiffness Matrix and Load Vector.

UNIT II STRESS ANALYSIS 12 Hrs

Two Dimensional problems - Plane Stress, Plain Strain and Ax symmetric Problems - Triangular and Quadrilateral Elements - Natural Coordinates - Isoperimetric Formulation - Numerical Integration - Plate Bending and Shell Elements - Brick Elements - Elements for Fracture Analysis.

UNIT III MESHING AND SOLUTION PROBLEMS 12 Hrs

Higher Order Elements - p and h Methods of refinement - IIL conditioned Elements - Discrimination Errors –Auto and Adaptive Mesh Generation Techniques - Error Evaluation.

UNIT IV NONLINEAR AND VIBRATION PROBLEMS 12 Hrs

Material and Geometric No linearity - Methods of Treatment - Consistent System Matrices – Dynamic Condensation - Eigen Value Extraction.

UNIT V THERMAL ANALYSIS 12 Hrs

Application to Thermal analysis Problem

Total No of Hours: 60

REFERENCES

1. *Bathe , K.J., Finite Elements Procedures in Engineering analysis, Prentice Hall Inc., New Delhi 1995.*
2. *Zienkiewicz, O.C, and Taylor, R.L., The Finite Elements Methods , Mc Graw Hill New Delhi, 1987.*
3. *Chandrupatla, R.T. and Belegundu, A.D ., Introduction to Finite Elements in Engineering, 2nd Edition , Prentice Hall of India, New Delhi 1997.*
4. *Moaveni,S., Finite Element Analysis : Theory and Application with ANSYS, Prentice Hall Inc., New Delhi 1999.*

DEPARTMENT OF CIVIL ENGINEERING

MCE18SE03 **TALL STRUCTURES** **3 1 0 4**

OBJECTIVE

- To study the behaviour, analysis and design of tall structures.

UNIT I: DESIGN CRITERIA 12 Hrs

Design philosophy, Loading, Sequential loading, and materials - high performance Concrete - Fiber reinforced Concrete - Light weight Concrete - Design mixes.

UNIT II: LOADING AND MOVEMENT 12 Hrs

Gravity Loading: Dead and live load, methods of live load reduction, Impact, gravity loading, construction load. **Wind loading:** Static and dynamic approach, Analytical and wind tunnel experimental method.

Earthquake loading: Equivalent lateral force, modal analysis, combinations of loading working stress design, Limit state design, plastic design.

UNIT III: BEHAVIOUR OF VARIOUS STRUCTURAL SYSTEMS 12 Hrs

Factors affecting growth, Height and Structural form. High rise behaviour, Rigid frames, braced frames, Infilled frames, shear walls, coupled shear walls, wall-frames, tubulars, cores, futrigger - braced and hybrid mega system.

UNIT IV: ANALYSIS AND DESIGN 12 Hrs

Modeling for approximate analysis, Accurate analysis and reduction techniques, Analysis of building as total structural system considering overall integrity and major subsystem interaction, Anlysis for member forces, drift and twist, computerised general three dimentional analysis.

Structural Elements : Sectional shapes, properties and resisting capacity, design, deflection, cracking, prestressing, shear flow. Design for diffenential movement, creep and shrinkage effects, temperature effects and fire resistance.

UNIT V: STABILITY OF TALL BUILDINGS 12 Hrs

Overall buckling analysis of frames, wall-frames, Approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first-order and P-Delta analysis, Translational, Torsional instability, out of plum effects, stiffness of member in stability, effect of foundation rotation.

Total No of periods: 60

TEXT BOOK

1. Taranath B.S., Structural Analysis and Design of Tall Building, McGraw Hill, 1988.

REFERENCES

1. *Dr. Y.P.Gupta, Editor. Proceedings National Seminar on High Rise Structures Design and Construction practices for middle level cities Nov. 14 -16, 1995, New Age International Limited, Publishers, Madras -20.*
2. *Wilf gang Schuller, High Rise Building Structures, John Wiley and Sons, New Jercy 1977.*
3. *Bryan stafford Smith, Alexcoull, Tall Building Structures , Analysis and Design,John Wiley and Sons, Inc New Jercy 1977*

DEPARTMENT OF CIVIL ENGINEERING

MCE18CE10 DISASTER MANAGEMENT 3 1 0 4

OBJECTIVE

- To study about Disaster Risk Management & development.

UNIT I INTRODUCTION TO DISASTERS 12 Hrs

Concepts, and definitions-Disaster, Hazard, Vulnerability, Resilience, Risks Disasters: Classification, Causes, Impacts -including social, economic, political, environmental, health, psychosocial, etc.)

UNIT II RISK MANAGEMENT 12 Hrs

Goals and objectives of ISDR Programme- Risk identification – Risk sharing – Disaster and development: Development plans and disaster management –Alternative to dominant approach – disaster-development linkages - Principle of risk partnership.

UNIT III RISK REDUCTION 12 Hrs

Trigger mechanism – constitution of trigger mechanism – risk reduction by education – disaster information network – risk reduction by public awareness Application of various technologies: Data bases – RDBMS – Management Information systems – Decision support system and other systems – Geographic information systems Remote sensing-an insight – contribution of remote sensing and GIS - Case study.

UNIT IV INTER-RELATIONSHIPS BETWEEN DISASTERS AND DEVELOPMENT: 12 Hrs

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc. Climate Change Adaptation. Relevance of indigenous knowledge, appropriate technology and local resources financial arrangements – areas of improvement –disaster preparedness — emergencyresponse.

UNIT V DISASTER RISK MANAGEMENT IN INDIA 12 Hrs

Hazard and Vulnerability profile of India Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management Institutional arrangements (Mitigation, Response and Preparedness, DM Act and Policy, Other related policies, plans, programmes and legislation)

Total No. of Hours: 60

TEXT BOOKS

1. Pardeep Sahni, Madhavi Malalgoda and Ariyabandu, “Disaster risk reduction in South Asia”, PHI
2. Amita Sinvhal, “Understanding earthquake disasters” TMH, 2010.

REFERENCE

1. *Pardeep sahni, Alka Dhameja and Uma Medury, “Disaster mitigation: Experiences and reflections”, PHI*

DEPARTMENT OF CIVIL ENGINEERING

MMA18SE01 OPTIMIZATION TECHNIQUES 3 0 0 3

OBJECTIVE

- To study about optimization techniques and algorithms and theorems.

UNIT I INTRODUCTION 9 **Hrs**

Basic concepts of minimum weight, minimum cost design, Objective function, constraints, classical methods.

UNIT II OPTIMIZATION TECHNIQUES AND ALGORITHMS 9 Hrs

Linear programming, Integer Programming, Quadratic Programming, Dynamic Programming and Geometric Programming methods for Optimal design of structural elements.

UNIT III COMPUTER SEARCH METHODS 9 Hrs

Linear Programming methods for plastic design of frames, Computer search methods for univariate and multivariate Minimization.

UNIT IV OPTIMIZATION THEOREMS 9 Hrs

Optimization by structural theorems, Maxwell, Mitchell and Heyman's Theorems for trusses and frames, fully stresses design with deflection constraints.

UNIT V STRUCTURAL APPLICATIONS 9 Hrs

Methods for optimal design of structural elements, continuous beams and single storied frames using plastic theory - Minimum weight design for truss members - Fully stressed design - Optimization principles to design of R.C. structures such as multistorey buildings, water tanks, bridges, shell roofs. Use of Software packages for optimization

Total No. of Hours: 45

REFERENCES

1. *Spunt, Optimum Structural Design, Civil Engineering and Engineering Mechanics Services,Prentice-Hall, New Jersey 1971.*
2. *S.S.Rao, Optimization Theory and Applications, Wiley Eastern Limited, New Delhi, 1977.*
3. *Uri Krisch, Optimum Structural Design, McGraw Hill Book Co. 1981.*
4. *Richard Bronson, Operation Research, Schaum's Outline Series, McGraw Hill Singapore, 1983.*

DEPARTMENT OF CIVIL ENGINEERING

MCE18SE04 PROBABILISTIC METHODS IN CIVIL ENGINEERING 3 0 0 3

OBJECTIVES

- To study about concepts of structural safety.
- Probablistic analysis.
- Semi – probabilistic design at various limit states.

UNIT I BASIC CONCEPTS OF STRUCTURAL SAFETY 9 Hrs

Basic concepts of structural safety Random variables and distribution probabilistic models – Nature of random variables and probabilities, union of events, conditional event, Baye's rule, uniform law, hyper geometric law,
Binomial law, Expected values, Calculation means and variances,

UNIT II APPROXIMATION 9 Hrs

Approximation by central limit theorem, Chebysheve inequality, Gauss inequality Monte Caralo approximation – Statistical inference, Least squares, significance test, Chi – Square test. Basic formulation of linear regression. Multiple linear and non-linear regression

UNIT III APPLICATIONS 9 Hrs

Applications –Collection and analysis of data on material strengths and loads safety factors – Reliability of structural systems.

UNIT IV PROBALISTIC ANALYSIS 9 Hrs

Probalistic analysis and design of reinforced concrete and prestressed concrete beams.

UNIT V SEMI- PROBABILISTIC ANALYSIS 9 Hrs

Semi – probabilistic design at various limit states – Design of columns – Reliability design of tension members, beams and columns, structural safety against dynamic forces.

Total No. of Hours: 45

REFERENCES

1. *Ang & Tang., Probability concepts in Engineering Planning & Design Tata McGraw Hill Publishing Co. 2nd Edition, Berlin 1988.*
2. *Benjamin & Cornell, Probability, Statistics and Decisions for Civil Engineers,*
3. *Tata McGraw Hill Publishing Co. 2nd Edition,Berlin 1988. Stark & Nichols, Mathematical Foundations for Designing Civil Engineering systems.Laportati, E., The Assessment of Structural Safety. Tata McGraw Hill Publishing Co. 2nd Edition,Berlin 1988.*
4. *Thoft Christensus & Bkaer, Structural Reliability Theory and its Applications, Springer Verlay. Tata McGraw Hill Publishing Co. 2nd Edition,Berlin 1988.*
5. *Papoulis A., Probability, Random Variables and Stochastic Process.Haugen,*
6. *Probabilistic Approaches to Design, John wiley. Tata McGraw Hill Publishing Co. 2nd Edition, Berlin 1988.*

DEPARTMENT OF CIVIL ENGINEERING

MCE18SE05 ADVANCED CONSTRUCTION MANAGEMENT 3 0 0 3

OBJECTIVE

- To study about CPM &PERT ,Types of contract, construction finance, construction process control.

UNIT I MANAGEMENT SCIENCE 8 Hrs

Introduction in construction – The organization of projects and contracts, control of time and money, engineering economics, planning and programming techniques. Scheduling Procedure & Techniques - CPM project planning & Searching – GANTT charts, milestone schedules – PERT & CPM and their use. Resource allocation, Resource leveling, Resource smoothing, updating.

UNIT II CONSTRUCTION CONTRACTS 9 Hrs

Indian Contract, Types of Contract, International Contract Document, Law of Traits Estimating and Pricing, FIDIC contract.

UNIT III PROJECT FINANCING 9 Hrs

Construction finance, planning of funds, budgeting, measurement and valuation, monitoring and reporting, linking time and money cost models, cost control and reporting project appraisal.

UNIT IV PRODUCTION MANAGEMENT ORGANIZING 9 Hrs

Materials planning, budgeting and inventory control management of surplus materials, equipment control, Quality Control. Development of human resources – Motivation, Performance & satisfaction.

UNIT V CONSTRUCTION PROCESS 10 Hrs

Construction process control, work-study, crew size, layout computers in project planning and construction management.

Total No of periods: 45

REFERENCES

1. *Hira A. Ahuja, Project Management – techniques in planning and controlling construction projects, wiley, Interscience London 1998.*
2. *Anthony Walker, project Management in Construction. London 1998*
3. *Frank Harris and Ronald Mc Catfer, Management and Investment Decisions Constructions Plant. London 1998*
4. *Thompson P.A., Organisation and Economics of Construction McGraw Hill, 1981. London*
5. *James. A.F. Stoner and Charles Wankel – Management – Prentice Hall of India, New Delhi, 1986.*

DEPARTMENT OF CIVIL ENGINEERING

MCE18SE06 OFFSHORE STRUCTURES 3 0 0 3

Objectives:

- This subject is taught to impart knowledge about analysis and design of offshore structures.

UNIT 1 RIGID AND FLEXIBLE STRUCTURES 9hrs

Wind on structures - Rigid structures - Flexible structures - Static and Dynamic effects.

UNIT 2 WAVE GENERATION 9hrs

Wave generation and Propagation - Small and finite amplitude wave theories - Wave energy and pressure distribution.

UNIT 3 WAVE FORCES 9hrs

Wave forces on structures - Environmental loading - Use of Morrison equation.

UNIT 4 TYPES OF STRUCTURES 9hrs

Different types of structures - Foundation modeling - Static methods of Analysis - Dynamics of off shore structures.

UNIT 5 DESIGN OF PLATFORM, HELIPAD, ETC… 9hrs

Loads - Design of platforms – Derricks – Helipads – Design - Principles and examples of Jacket towers - Mooring cables.

Total No. of Hours : 45

Text Book:

1. Chakrabarti, K (1997), Hydrodynamics of offshore structures, Computational Mechanics Publications.

REFERENCES :

1. Thomass Hdawsan, (1993), Offshore Structural Engineering, Prentice Hall Inc., Engle wood cliffs, New Jersey.
2. API, (2002), Recommended Practice for Planning, designing and Construction, Fixed offshore platform, American Petroleum Institute publication, RP2A, Dalls, Texas.

DEPARTMENT OF CIVIL ENGINEERING

MCE18SE07 SOIL STRUCTURE INTERACTION 3 0 0 3

OBJECTIVE

- To study about soil – Foundation Interaction problems Analysis of pile Foundation.

UNIT I: SOIL-FOUNDATION INTERACTION 9 Hrs

Introduction to soil-Foundation interaction problems, soil behaviour, Foundation behavior, Interface behaviour,
Scope of soil foundation interaction analysis, soil response models, Winkler, Elastic continuum, two parameter elastic models, Elastic plastic behaviour, Time dependent behaviour

UNIT II: BEAM ON ELASTIC FOUNDATION- SOIL MODELS 9 Hrs

Infinite beam, two parameters, Isotropic elastic half space, Analysis of beams of finite length, Classification of finite beams in relation to their stiffness

UNIT III: PLATE ON ELASTIC MEDIUM 9 Hrs

Infinite plate, Winkler, Two parameters, isotropic elastic medium, Thin and thick plates, Analysis of finite plates, rectangular and circular plates, Numerical analysis of finite plates, simple solutions

UNIT IV: ELASTIC ANALYSIS OF PILE 9 Hrs

Elastic analysis of single pile, Theoretical solutions for settlement and load distributions, analysis of pile group,Interaction analysis, Load distribution in groups with rigid cap.

UNIT V: LATERALLY LOADED PILE 9 Hrs

Load deflection prediction for laterally loaded piles, Subgrade reaction and elastic analysis, Interaction analysis, Pile raft system, Solutions through influence charts

Total No of periods: 45

REFERENCES

1. *Selva durai, A.P.S.., Elastic Analysis of Soil Foundation Interaction,Elsevier,1979*
2. *Poulos, H.G., and Davis,E.H., Pile Foundation Analysis and Design, John Wiley,Tata McGraw Hill Publishing Co. 2nd Edition,Berlin 1988.*
3. *Scott,R.F.,Foundation Analysis,Prentice Hall,1981 New Jercy*
4. *Structure Soil Interaction - State of Art Report,Institution of Structural Engineers, New Delhi 1978.*
5. *ACI 336, Suggested Analysis and Design Procedures for combined footings and Mats, American Concrete Institute, Delhi,1988*

DEPARTMENT OF CIVIL ENGINEERING

MCE18SE08 DISASTER RESISTANT STRUCTURES 3 0 0 3

OBJECTIVE

- To study about the structural design to resist different natural calamities Rehabilitation and retrofitting of disastered structures.

UNIT I BEHAVIOUR OF LIFE-LINE STRUCTURES 9 Hrs

Philosophy for design to resist earthquake, cyclone and flood - National and International codes of practice - By-Law of urban and semi-urban areas - Traditional and modern structures.

UNIT II COMMUNITY STRUCTURES 9 Hrs

Response of dams, bridges, buildings - Strengthening measures - Safety analysis and rating – Reliability assessment.

UNIT III: REHABILITATION AND RETROFITTING 9 Hrs

Testing and evaluation - Classification of structures for safety point of view - methods of strengthening for different disasters - qualification test.

UNIT IV DETAILING OF STRUCTURES AND COMPONENTS 9 Hrs

Use of modern materials and their impact on disaster reduction - Use of modern analysis, design and construction techniques optimization for performance.

UNIT V DAMAGE ASSESSMENT OF STRUCTURES 9 Hrs

Damage surveys - Maintenance and modifications to improve hazard resistance - Different types of foundation and its impact on safety - Ground improvement techniques.

Total No of Hours: 45

TEXT BOOKS

1. V.Moskvin , et.all Concrete and Reinforced Concrete - Deterioration and Protection - Mir Publishers - Moscow 1980.
2. R.T. Allen and S.C. Edwards, Repair of Concrete Structures, Blakie and Sons, U.K 1987.

REFERENCES

1. *Proceedings IABSE 14th Congress "Civilisation through Civil Engineering" New Delhi, 1992.*
2. *Raiker R.N.Learning from failures Deficiencies in Design, Construction and Service ,*
3. *R & D Center (SDCPL) Raiker Bhavan, Bombay , 1987.*

DEPARTMENT OF CIVIL ENGINEERING

MCE18SE09 **DESIGN OF BRIDGES** **3 0 0 3**

OBJECTIVE

- To study the loads, forces on bridges and design of several types of bridges.

UNIT I: INTRODUCTION **9 Hrs**

Classification, investigations and planning, choice of type, I.R.C .specifications for road bridges, standard live loads, other forces acting on bridges, general design considerations.

UNIT II: SHORT SPAN BRIDGES **9 Hrs**

Load distribution theories, analysis and design of slab culverts, tee beam and slab bridges.

UNIT III: LONG SPAN GIRDER BRIDGES **9 Hrs**

Design principles of continuous bridges, box girder bridges, balanced cantilever bridges.

UNIT IV: DESIGN OF PRESTRESSED CONCRETE BRIDGES **9 Hrs**

Design of prestressed concrete bridges - Preliminary dimensions - - Design of girder section - Maximum and minimum prestressing forces - Eccentricity - Live load and dead load shear forces - cable zone in girder -Short term and long term deflections.

UNIT V: BEARINGS, SUBSTRUCTURES AND FOOTINGS FOR BRIDGES **9 Hrs**

Design of bearings – Foundation for bridges – Well and caisson foundation – Design of pier cap - Design of pier

Total No of Hours: 45

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, 1988*
3. *Bakht, B. and Jaegar, L.G., "Bridge Analysis simplified", McGraw Hill, 1985.*
4. *Ponnuswamy, S., "Bridge Engineering", Tata McGraw Hill, 1989*
5. *Derrick Beckett, "An introduction to Structural Design of Concrete Bridges", Surrey Press, Henley Thomes, Oxford Shire, 1973.*
6. *Taylor, F.W., Thomson, S.E., and Smulski E., "Reinforced Concrete Bridges", John Wiley and Sons, New York, 1955.*

DEPARTMENT OF CIVIL ENGINEERING

MCE18SE10 ENVIRONMENTAL ENGINEERING STRUCTURES 3 0 0 3

OBJECTIVES

- To develop a basic knowledge about the environmental engineering structures and apply the same in the field application.
- At the end of the subject the students will able to design environmental engineering structures such as pipes, water tanks, special structures, repair and rehabilitation of structures and maintenance.

UNIT I DESIGN OF PIPES 9 Hrs

Structural design of a) Concrete b) Prestressed Concrete c) Steel and d) Cast-iron piping mains, sewerage tanks design - anchorage for pipes - massive outfalls - structural design and laying - hydrodynamic considerations. Advances in the manufacture of pipes.

UNIT II ANALYSIS AND DESIGN OF WATER TANKS 9 Hrs

Design of concrete roofing systems a) Cylindrical b) Spherical and c) Conical shapes using membrane theory and design of various types of folded plates for roofing with concrete. IS Codes for the design of water retaining Structures. Design of circular, rectangular, spherical and Intel type of tanks using concrete. Design of prestressed concrete cylindrical tanks - Economic analysis - introduction to computer aided design and packages.

UNIT III DESIGN OF SPECIAL PURPOSE STRUCTURES 9 Hrs

Underground reservoirs and swimming pools, Intake towers, Structural design including foundation of water retaining structures such as settling tanks, clarifloculators, aeration tanks etc. - effect of earth pressure and uplift considerations - selection of materials of construction**.**

UNIT IV REPAIR AND REHABILITATION OF STRUCTURES 9 Hrs

Underground reservoirs and swimming pools, Intake towers, Structural design including foundation of water retaining structures such as settling tanks, clarifloculators, aeration tanks etc. - effect of earth pressure and uplift considerations - selection of materials of construction. Diagnosing the cause and damage, identification of different types of structural and non-structural cracks – repair and rehabilitation methods for Masonry, Concrete and Steel Structures.

UNIT V EXPOSURE ON STEEL, LATTICE STRUCTURES USED IN WATER AND SEWERAGE WORKS 9 Hrs

Diagnosing the cause and damage, identification of different types of structural and non-structural cracks – repair and rehabilitation methods for Masonry, Concrete and Steel Structures.

Total No of Hours: 45

TEXT BOOKS

1. Reinforced Concrete by P.Dayaratnam . S.Chand and Co.New Delhi 1985
2. Prestressed Concrete by Krishna Raju, Tata McGraw Hill Publishing Co. 2nd Edition New Delhi, 1988.
3. Reinforced Concrete by N.C.Sinha & S.K.Roy - S.Chand and Co.New Delhi 1985.

REFERENCES

1. *Hulse R., and Mosley, W.H., "Reinforced Concrete Design by Computer Macmillan Education Ltd., UK 1986.*
2. *Ramaswamy, G.S., "Design and Construction of Concrete shell roofs ", CBS Publishers, India, 1986.*
3. *Green, J.K. and Perkins, P.H., "Concrete liquid retaining structures ", Applied Science Publishers, India 1981.*

DEPARTMENT OF CIVIL ENGINEERING

MCE18SE11 EXPERIMENTAL TECHNIQUES AND INSTRUMENTATION 3 0 0 3

OBJECTIVE

- To study different Measurements & non destructive testing methods.

UNIT I FORCES AND STRAIN MEASUREMENT 9 Hrs

Strain gauge, Principle, types, performance and uses. Photo elasticity- principle and application-Moire fringe-Hydraulic jacks and pressure gauges- Electronic load cells-proving rings – Calibration of Testing Machines.

UNIT II VIBRATION MEASURME 9 Hrs

Characteristics of Structural Vibrations-Linear Variable Differential Transformer (LVDT)-Transducers for velocity and acceleration measurement. Vibration Meter-Seismographs-Vibration Analyzer-Display and Recording of signals-Cathode Ray Oscilloscope-XY Plotter-Digital Data Acquisition System.

UNIT III ACOUSTICS AND WIND FLOW MEASURES 9 Hrs

Principles of Pressure and flow measurements-Pressure transducers- sound level meter- venturimeter and flow meters- wind tunnel and its use in structural analysis- structural analysis- structural modeling- direct and indirect model analysis

UNIT IV DISTRESS MEASUREMENTS AND CONTROL 9 Hrs

Diagnosis of distress in structures- crack observation and measurements- corrosion of reinforcement in concrete-Half cell, construction and use- damage assessment- controlled blasting for demolition

UNIT V NON DESTRUCTIVE TESTING METHODS 9 Hrs

Load testing on structures, buildings, bridges and towers- Rebound hammer- acoustic emission-ultrasonic testing principles and application- Holography- use of laser for structural testing- Brittle coating.

Total No. of Hours: 45

REFERENCES

1. *Sadhu singh- Experimental stress Analysis, Khanna Publishers, New Delhi, 1996*
2. *JW dalley and WF Riley, Experimental Stress Analysis,Mc Graw Hill Book Company, N.Y.1991*
3. *L.S.Srinath et.al, experimental stress Analysis, Tata Mc Graw Hill Company, New Delhi 1984*
4. *R.S.Sirohi, HC Radhakrishna, Mechanical Measurements, NewAge International(P) Ltd 1997*
5. *F.K.Garas, J.L.Clarke and GST Armer,Structural assessment, Butterworths.London,1987*
6. *D.E.Bray & R.K.Stanley, Non- destructive Evaluation, Mc. Graw Hill Publishing Company,N.Y.1989*
7. *John Tuner and Martyn Hill, Instrumentation for engineers and scientists, Oxford Press, 1999.*

DEPARTMENT OF CIVIL ENGINEERING

MCE18SE12 PAVEMENT ENGINEERING 3 0 0 3

OBJECTIVE:
Student gains knowledge on various IRC guidelines for designing rigid and flexible pavements. Further, he/she will be in a position to assess quality and serviceability conditions of roads.

UNIT I TYPE OF PAVEMENT AND STRESS DISTRIBUTION ON LAYERED SYSTEM 8 Hrs

Introduction – Pavement as layered structure – Pavement types rigid and flexible. Resilient modulus - Stress and deflections in pavements under repeated loading**.**

UNIT II DESIGN OF FLEXIBLE PAVEMENTS 10 Hrs

Flexible pavement design factors influencing design of flexible pavement, Empirical - Semi empirical and theoretical methods – Design procedure as per IRC guidelines – Design and specification of rural roads.

UNIT III DESIGN OF RIGID PAVEMENTS 9 Hrs

Cement concrete pavements factors influencing CC pavements – Modified Westergaard approach – Design procedure as per IRC guidelines – Concrete roads and their scope in India**.**

UNIT IV PERFORMANCE EVALUATION AND MAINTENANCE 10 Hrs

Pavement Evaluation - causes of distress in rigid and flexible pavements – Evaluation based on Surface Appearance, Cracks, Patches and Pot Holes, Undulations, Raveling, Roughness, Skid Resistance. Structural Evaluation by Deflection Measurements - Pavement Serviceability index. - Pavement maintenance (IRC Recommendations only).

UNIT V STABILIZATION OF PAVEMENTS 8 Hrs

Stabilisation with special reference book to highway pavements – Choice of stabilizers – Testing and field control Stabilisation for rural roads in India – use of Geosynthetics in roads.

Total No. of Hours: 45

TEXT BOOKS:

1. Wright P.H. ”Highway Engineers”, John Wiley and Sons, Inc., New York, 1996.
2. Khanna, S.K. and Justo C.E.G. “Highway Engineering”, New Chand and Brothers (8th Edition), Roorkee, 2001.
3. Kadiyali, L.R. ‘Principles and Practice of Highway Engineering”, Khanna tech.Publications, New Delhi, 1989.

DEPARTMENT OF CIVIL ENGINEERING

MCE18SE13 DESIGN CONCEPTS OF SUBSTRUCTURES 3 0 0 3

OBJECTIVE:

- The objectives of this course is to make students to learn principles of subsoil exploration, design the sub structures and to evaluate the soil shear strength parameters.

UNIT I INTRODUCTION 9 Hrs

Introduction, Site investigation, In-situ testing of soils, Subsoil exploration, Classification of foundations systems. General requirement of foundations, Selection of foundations, Computations of Loads, Design concepts.

UNIT II SOIL STABILITY 9 Hrs

Concept of soil shear strength parameters, Settlement analysis of footings, Shallow foundations in clay, Shallow foundation in sand & C-Φ soils, Footings on layered soils and sloping ground, Design for Eccentric or Moment Loads.

UNIT III DESIGN OF SHALLOW FOUNDATIONS 9 Hrs

Types of rafts, bearing capacity & settlements of raft foundation, Rigid methods, Flexible methods, soil-structure interaction, different methods of modeling the soil. Combined footings (rectangular & trapezoidal), strap footings & wall footings, Raft – super structure interaction effects & structural design, of basement slabs.

UNIT IV DESIGN OF DEEP FOUNDATIONS 9 Hrs

Deep Foundations: Load Transfer in Deep Foundations, Types of Deep Foundations, Ultimate bearing capacity of different types of piles in different soil conditions, Laterally loaded piles, tension piles & batter piles, Pile groups: Bearing capacity, settlement, uplift capacity, load distribution between piles, Proportioning and design of piles.

UNIT V SPECIAL SUB STRUCTURES 9 Hrs

Types of caissons, Analysis of well foundations, Design principles, Well construction and sinking. Foundations for tower structures: Introduction, Forces on tower foundations, Selection of foundation type, Stability and design, Ring foundations – general concepts.

Total No. of Hours: 45

REFERENCES

1. Swami Saran – "Analysis & Design of Substructures"- Oxford & IBH Pub. Co. Pvt. Ltd., 1998.
2. Nainan P Kurian – "Design of Foundation Systems"- Narosa Publishing House, 1992.
3. R.B. Peck, W.E. Hanson & T.H. Thornburn – "Foundation Engineering"- Wiley Eastern Ltd.,Second Edition, 1984.
4. J.E. Bowles – "Foundation Analysis and Design"- McGraw-Hill Int. Editions, Fifth Ed., 1996.
5. W.C. Teng – "Foundation Design"- Prentice Hall of India Pvt. Ltd., 1983.
6. Bureau of Indian Standards:IS-1498, IS-1892, IS-1904, IS-6403, IS-8009, IS-2950, IS-11089, IS-11233, IS-2911 and all other relevant codes.

DEPARTMENT OF CIVIL ENGINEERING

MCE18SE14 DESIGN OF INDUSTRIAL STRUCTURES 3 0 0 3

OBJECTIVES:

- The objectives of this course is to make students to learn principles of Design of industrial building , To design different components of industrial structures and to detail the structures. To evaluate the performance of the Pre- engineered buildings.

UNIT I INTRODUCTION 9 Hrs

Analysis of industrial building for Gravity and Wind load. Analysis and design of framing components namely, girders, trusses, gable frames

UNIT II GANTRY GIRDER 9 Hrs

Analysis and design of gantry girder, purlins, girts, bracings including all connections.

UNIT III TRANSMISSION TOWERS 9 Hrs

Analysis of transmission line towers for wind load and design of towers including all connections.

UNIT IV COLD FORMED STRUCTURES 9 Hrs

Forms of light guage sections, Effective width computation of unstiffened, stiffened, multiple stiffened compression elements of cold formed light guage sections. Concept of local buckling of thin elements. Limiting width to thickness ratio. Post buckling strength.

UNIT V PRE – ENGINEERED STRUCTURES 9 Hrs

Concept of Pre- engineered buildings, Design of compression and tension members of cold formed light guage sections, Design of flexural members (Laterally restrained / laterally unrestrained).

Total No. of Hours: 45

REFERENCES

1. Bureau of Indian Standards, IS 800-2007, IS 875-1987, IS-801-1975. Steel Tables, SP 6 (1) – 1984
2. N Subramanian- "Design of Steel Structure" oxford Press
3. B.C. Punmia, A.K. Jain "Design of Steel Structures", Laxmi Publications, New Delhi.
4. . Ramchandra and Virendra Gehlot " Design of Steel Structures " Vol 1 and Vol.2, Scientific Publishers, Jodhpur
5. Duggal "Limit State Design of Steel Structures" TMH