

S Y L L A B U S

**MASTER OF TECHNOLOGY
(STRUCTURAL ENGINEERING)**

M. Tech.

**M. Tech., First Year Examination, 2015
M. Tech., Second Year Examination, 2016**



**JODHPUR NATIONAL UNIVERSITY
JODHPUR**

Jodhpur National University
M.Tech. Programme, CIVIL (Structural Engineering)
TEACHING/EXAMINATION SCHEME & SYLLABUS

I SEMESTER

Subject Code	Subject	Hrs. / Week				Marks Exam			Exam Hrs
		L	T	P	Total	Theory Exam/ Viva Voce	Internal Assessment	Total	
MCE 121	Strategic Management	4	2	-	6	100	50	150	3
MCE 122	Engineering Mathematics	4	2	-	6	100	50	150	3
MCE 123	Advanced Structural Analysis	4	2	-	6	100	50	150	3
MCE 124	Advanced Design of Concrete Structures	4	2	-	6	100	50	150	3
MCE 125	Computer Aided Design of Structure (Laboratory)			6	6	50	50	100	3
	Total	16	8	6	30	450	250	700	15

II SEMESTER

Subject Code	Subject	Hrs. / Week				Marks			Exam Hrs
		L	T	P	Total	Theory Exam/ Viva Voce	Internal Assessment	Total	
MCE 221	Finite Element Analysis	4	2	-	6	100	50	150	3
MCE 222	Dynamics of Structures	4	2	-	6	100	50	150	3
	*(Any One from 03)								
MCE 223.1	Pavement analysis & Design								
MCE 223.2	Applied Elasticity								
MCE 223.3	Tall Buildings	4	2	-	6	100	50	150	3
MCE 224	Bridge Engineering	4	2		6	100	50	150	3
MCE 225	Structural Engineering Laboratory	-	-	6	6	50	50	100	3
	Total	16	8	6	30	450	250	700	15

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III SEMESTER

Subject Code	Subject	Hrs. / Week			Marks				Exam Hrs
		L	T	P	Total	Theory/ practical Exam	Internal Assessment	Total	
	*(Any One from 01)								
MCE 321.1	Advance Steel Structures								
MCE 321.2	Optimization in Structural Analysis	4	2	-	6	100	50	150	3
MCE 321.3	Design of Steel Bridges								
MCE 321.4	Composite Structures								
	*(Any One from 02)								
MCE 322.1	Repair and Rehabilitation of Structures								
MCE 322.2	Disaster Mitigation Earthquake Engineering	4	2	-	6	100	50	150	3
MCE 322.3	Advanced Foundation Design								
MCE 322.4	Ground Improvement								
MCE 323	Seminar	-	-	6	6	100	-	100	3
	Total	8	4	6	18	300	100	400	9

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IV SEMESTER

Subject Code	Subject	Hrs. / Week				Marks		
		L	T	P	Total	Theory\ Practical Exam	Internal Assessment	Total
MCE 421	Dissertation	-	-	-	-	200	-	200
	Total	-	-	-	-	200	-	200

Total Marks: 700 + 700 + 400 + 200 = 2000

*Only those subjects shall be offered in the **ELECTIVE** whose **facility** is available in the department. The decision of the Head of the Department (CIVIL) shall be final.

I SEMESTER

MCE 121

Strategic Management

(4-2-0)

Exam Hrs:-3

M.M.: -100+50 =150

Basics of Management: Scientific management: Fredrick Winslow Taylor; Henry foyal's administrative Management; Managerial Roles; Managerial skills.

Managing Change: Need for change; Paradigm shifts; Organization inertia; Leadership committed to change; Strategy of managing change; case studies highlighting steps needed for managing change successfully.

Crisis Management: Contingencies; contingency planning; Visualizing possible majors problems for the organization in the foreseeable future; Preparing an organization and its staff to deal with such problems; case studies.

Innovation and Creativity: Encouraging creativity at all levels; Innovation; key for future leadership; Innovation for product; process or the organization itself; Increment improvement v/s quantum jump.

Entrepreneurship: Need of the hour: Entrepreneurship; Developing qualities for entrepreneurship; Calculated Risk; Entrepreneurship within an organization.

Work study and Re-engineering: Productivity; Methods of improving productivity by changes in the manufacturing process as well as by better utilization of assts; Re-engineering the product process as well as the organizational set up.

Managing Intangibles: Management at different levels in an organization; Organizational culture; Leadership effective leadership for overall success; Motivation; Developing a diverse workforce; Negotiations within the organization; Attitudes and Behavior.

Communication Skills: Communication Basic: Written and Verbal communication, Presentation skill, Meetings and their effective; organization; Dealing / Interacting with customers.

Quality and Customer Care: Quality Management; Reliability of product; Defect and Defect Analysis; Total Quality; Economics of Quality; Quality Standards and ISO-9000; Customer care and important outcome of quality and quality relationship.

Safety and Ergonomics: Safety its practice at all levels; Safety training; Importance of safety; Cost of neglecting safety; Environment and need to maintain a clean and healthy environment; Ergonomics-a new term combining nature and its inhabitants.

Suggested Books:

1. Principles of Management by Charles WL Hill and steven L Mcshane;
(Tata McGrawh-Hill' New Delhi; 2008)
2. Principles of Management by PC Tripathi and PN Reddy;
(Tata McGrawh-Hill' New Delhi; 1991.)
3. Organizational Behavior by John W. Newstrom and Keith Danis;
(Tata McGrawh-Hill' New Delhi; 2002)

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MCE 122 Engineering Mathematics

(4-2-0)
Exam Hrs: - 3
M. M.: - 100+50= 150

Function of a complex variable : Exponential, Trigonometric hyperbolic and logarithmic functions. Analytic function, Cauchy-Riemann equations. Cauchy's Integral formula, Laurent's expansion residues. Schwarz Christoffel transformation and conformal mapping, conjugate functions and their applications to two dimensional potential problems.

Zero of polynomials by the Newton-Raphson method, Fourier series and harmonic analysis.

Elements of statistics, standard deviation, coefficient of variation, correlation curve, Gaussian error function, fitting. Linear partial differential equations of the second order.

Programmemeing in C+ of the algorithms of all the above numerical methods.

Tensor: General Tensors, Algebra of tensors, Cartesian tensors and basic operations. Simple application to elasticity.

Suggested Books:

- | | | |
|----|---|---|
| 1. | igher Engineering Mathematics by Gaur & Kaul | H |
| 2. | igher Engineering Mathematics by Gokhroo | H |
| 3. | igher Engineering Mathematics by Mehta & Sharma | H |
| 4. | igher Engineering Mathematics by B.S. Grewal | H |
| 5. | igher Engineering Mathematics by H.K. Das | H |

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MCE 123 Advanced Structural Analysis

(4-2-0)
Exam Hrs:-3
M.M.: -100+50 =150

Static and kinematic indeterminacy, Principle of Virtual work, Stiffness & Flexibility Matrices, Force-Displacement methods, element approach. Application to continuous beams, plane and space frame problems. Formulation of stiffness matrix for a typical multistory apartment building an industrial structure. Methods for nonlinear analysis, material and geometrical and boundary conditions nonlinearities. Large deformation eleasto-plastic analysis of frames, introduction to iterative incremental procedure. Application of computer programmemeing to solve these problems.

Suggested Books:

1. Matrix analysis of frames and structures by W. Weaver Jr. and J.M. Geve, (CBS Publishers & Distributers.)

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MCE 124 Advanced Design of Concrete Structures

(4-2-0)
Exam Hrs:-3
M.M.: -100+50 =150

Revision of basic concepts of Limit State Design of prismatic members in flexure, shear & bond. Redistribution of Moments in Fixed & Two span continuous beams. Calculation of deflection due to load, shrinkage & creep and calculation of crack width as per IS code. Analysis & Design of axially loaded Short column & analysis with uniaxial and biaxial bending, Column interaction diagram, its construction & use. Introduction to design and analysis of slender columns. Introduction to Analysis & Design of folded plates and shells. Yield line theory for slabs, yield line mechanisms, equilibrium and virtual work methods, special aspects, Hillerborg's strip method.

Suggested Books:-

1. Reinforced concrete structures by R. Park and T. Pauley, (Publications of John Wiley and Sons.)
2. Reinforced Concrete, Limit State Design, A.K. Jain, (Publications of Nemchand and Bros. 1999.)
3. Plain and Reinforced Concrete, Volume II, J. Krishna and O P Jain; (Publications of Nemchand and Bros.)
4. Design of concrete structures, H. Nilson, D. Darwin and C.W. Dolar, (Publications of Tata McGraw Hill)
5. Sismic design of Reinforced Concrete and Masonary Building by T. Paulay and M.J.N Priestley, (Publications of John Wiley and Sons Inc.)
6. Concrete Structure by G.S. Ramaswamy
7. I.S. Code- IS-456
8. Reynolds & Steedman hand book.

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MCE 125 Computer Aided Design of Structure (Laboratory)

(0-0-6)
Exam Hrs:-3
M.M.: 50+ 50=100

Part -1 (Basic Programmemeing in C++)

Introduction: Graph theory, Numerical methods, Matrix Algebra, Structural Analysis
Programmemeing techniques for Matrix and Finite Element Methods using skeletal and
planar elements

- i) Programmemeing for Mean, Mode, Median, Standard Deviation using c++.
- ii) Programmemeing for Interpolation using c++.
- iii) Programmemeing for Numerical Integration using c++.
- iv) Programmemeing for Matrix operations Addition, Subtraction, Multiplication
Inversion using c++.
- v) Exposure to softwares related to Finite Elements method

Part-2 (CAD Lab & MAT Lab)

Introduction: Structural Design An overview of commercial CAD softwares,
General features and basic applications of STAAD Pro/Core

Suggested Books: -

1. Principles of interactive computer graphic by William M. Newman and
Robert F.Sproul.
2. Programmemeing in finite Element by Hunton and Owan
3. Principles of computer Aided design by Joe Rooney and Philips Steadman.

II SEMESTER

MCE 221 Finite Element Analysis

(4-2-0)

Exam Hrs:-3

M.M.:-100+50=150

Finite element techniques: One dimensional Problems, FEM modeling, coordinates & shape functions, discretization, energy and variational approaches, basic theory, use of parametric and local coordinates, convergence criteria, numerical integration. Element formulations, 2-D elements, plate bending elements, introduction to three dimensional elements. Applications, plane stress and plain strain problems, axi-symmetric solids, plates and shell structures, temperature problems.

Finite element equation treatment and boundary conditions, quadratic shape function (serendipity & Lagrangia). C_0 and C_1 (Hermitian Polynomial continuity), effect of temperature.

Non linear problems: Review of iterative and incremental procedure for material and geometrically nonlinear problems, examples from plane stress and plane strain.

Introduction to programming, organization of FEM programmes, equation solving techniques, input/output plotting (pre and post processor) and mesh generation aspects.

Suggested Books: -

1. Finite Element Analysis – Theory and programming by Krishanmurthy,
2. Numerical Method infinite Element Analysis by Bathe, K.J. Wilson, EL

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MCE 222 Dynamics of Structures

(4-2-0)

Exam Hrs:-3

M.M.: 100+50=150

Introduction, Systems with single degree of freedom (SDOF) Equation of Motion – Analysis of Free vibration-response to harmonic , impulsive, periodic and general dynamic loadings(Green’s function/ Duhamel integral). forced and free vibration response of MDOF damp and un-damped discrete system-equation of motion-evaluation of natural frequencies and modes – approximate methods, overview of dynamics of continuous elastic systems-flexural beams-shear beams-columns, base excited system-formulation of equations for SDOF & MDOF systems-concepts of spectral quantities and response spectrum-fundamental of earthquake engg., computational and numerical methods-solution of eigen value problems mode superposition method and modal truncation errors-modal acceleration method, direct integration method- explicit and implicit methods.

Suggested Books: -

1. Dynamics of Structures by Clough and Penzien
2. Mechanical Vibrations by G.K. Grover
3. Dynamics of Structures by Walter C. Hurty & Moshe F. Rubinsten
4. Dynamics of Structures by ‘A. K. Chopra’.

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MCE 223.1 Pavement analysis and design

(4-2-0)

Exam Hrs:-3

M.M.:-100+50 =150

Components of pavement structure, importance of Sub-Grade soil properties on pavement performance. Functions of Sub-Grade, sub-base course and wearing course.

Stresses in flexible pavements: Stresses in homogeneous masses and layered system, deflections, shear failures, equivalent wheel and axle loads.

Elements in design of flexible pavement: Loading characteristics-Static, impact and repeated loads, affects of dual wheels and tandem axles, area of contact and tyre pressure, modulus, CBR value of different layers, equivalent single wheel load, equivalent deflection criterion, equivalent wheel load factors, climatic and environmental factors.

Types of distress: Structural and functional, serviceability, fatigue cracking, pavement deformation and low temperature shrinkage cracking. Factors affecting performance. Relation between performance & distress.

Design methods for flexible pavement: Group Index method, California bearing ratio (CBR), Triaxial method, Mcleod Method, Benkelman Beam method. Boussiusq's and Burmister's analysis and design method. Design of flexible airport pavements.

Elements in design of rigid pavements: Wheel load, stresses, Westergaard's analysis. Basic properties of concrete elasticity, shrinkage & creep, durability of concrete, rigid pavement design, concrete mix design.

Temperature stresses: Thermal properties of aggregates and concrete. Effect of temperature variations on concrete pavements. Westergaard's and Tomlinson's analysis of warping stresses.

Pavement overlays: Flexible overlays and rigid overlays.

Suggested Books:

1. "Principles & Practice of Highway Engineering by Kadiyali L.R., (Khanna Publisher)
2. "Principles & Practice of Highway Engineering" by Chakroborty P Das (Khanna Publisher 2000)
3. "Highway Engineering:, by Khanna & Justo, (Nem Chand & Brothers, Roorkee, 1997)
4. "Principles of Pavement Design," by E.J. Yoder, (John Wiley & Sons Inc., New York.)
5. IRC, ASTM, AASHTO and other Codes, Manuals and Specifications.
6. "Functional Designing of Pavements" by Teng .
7. "Paveemnt Analysis & Design by Huang (Prentice Hall - 2003)
8. "Principles of Pavement Design" by Yoder E.J. and Witezak - (Wiley & Sons, 1975)
9. "Modern Pavement Management" by Ralph Haos, Ronald Hudson & Zaniesuki (Kneiger Publication,1994)

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TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 223.2 Applied Elasticity

(4-2-0)

Exam Hrs:-3

M.M.:-100+50 =150

Plane stress and plane strain problems. General stress and strain equations (Equilibrium and compatibility equations). Two dimensional problems in rectangular coordinates. Stress and strain components, differential equation, equilibrium equations and compatibility equations in polar coordinate. Stress distribution for axisymmetric problems. Pure bending of curved bars, thick walled cylinder. Concentrated force at a point of straight boundary. Force acting on the end of a wedge. Concentrated force acting on a beam. Effect of circular holes on stress distributions in plates.

Stress and strain in three dimensions: Principles stresses, maximum shearing stress, principal axes of strain. Stretching of prismatical bar by its own axis. Elementary problems of elasticity in three dimension. Torsion of non-circular prismatic bars. Saint Venant's theory. Various analogies. Torsion of hollow and thin section. Application of energy methods.

Suggested Books: -

1. Theory of Elasticity by S P Timoshenko and J N Goodier, (McGraw Hill)
2. Applied Elasticity- by C.T. Wang

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MCE 223.3 Tall Buildings

(4-2-0)
Exam Hrs:-3
M.M.: -100+50 =150

Structural systems of tall buildings ; Moment resistant. Frames, braced frames, eccentrically braced frames, shear walls, coupled shear walls, frame shear wall interaction, tubular structures; approximate and matrix oriented methods of design of tall buildings;

Suggested Books: -

1. Structural Analysis and design of Tall Building by Tara Nath Bungale.
2. Advances in tall buildings by Beedle L.S.
3. Analysis of Shear Walled Buildings by Robert B. Morais
4. Design of multistory reinforced concrete buildings for earthquake motion by J.A. Blume, N.M. Newmark.

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TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 224 Bridge Engineering

(4-2-0)
Exam Hrs:-3
M.M.: -100+50 =150

Introduction, historical review, engineering and aesthetic requirements in bridge design. Introduction to bridge codes. Economic evaluation of a bridge project. Site investigation and planning; Scour-factors affecting and evaluation. Bridge foundations – open, pile, well and caisson. Piers, abutments and approach structures; Superstructure – analysis and design of right, skew and curved slabs. Girder bridges – types, load distribution, design Orthotropic plate analysis of bridge decks. Introduction to long span bridges – cantilever, arch, cable stayed and suspension bridges. Methods of construction of R.C Bridges, Prestressed Concrete bridges and steel bridges Fabrication, Launching & creation. Design and construction of construction joints.

Suggested Books: -

1. Bridge deck behavior, by E.C. Hambly (Chapman and Hall, London)
2. Bridge deck analysis by E.J.O' Brien and D.L. Keogh, (E & FN. Spon, New York)
3. Essentials of Bridge engineering, by D. Johnson Victor, (Oxford & IBH publishing Co. Ltd. New Delhi.)
4. Design of Bridges, by N. Krishna Raja (Oxford & IBH Publishing Co. Ltd. New Delhi.)
5. Plain a reinforced concrete Vol II.Jai krishna and O.P.Jain,
(Nemchand & Bros. Roorkee.)
6. IRC-5-1970, standard specification and code of Practice for Road Bridges, Section I to V, Indian Road Congress N. Delhi.
7. Indian railway standard code of Practice for the design of steel or wrought iron bridge Carrying Rail, road or pedestrian traffic, Govt. of India, Ministry of Railway. 1962
8. Concrete Bridges Practice – Analysis design and Economics, V.K. Raina, (Shroff Publications, New Delhi 2nd Ed. 2005)
9. Design of Concrete Bridges, Vazirani, Ratwani and Aswani, (Khanna Publishers, 2nd Ed. 2008)
10. IRC: Special Publications: 13-1973 -Guidelines for the Design of Small Bridges & Culverts.

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MCE 225 Structural Engineering Laboratory

(0-0-6)
EXAM HRS:-3
M.M.: -50+50 =100

1. Mix design of concrete of different grades & using admixtures.
2. Testing of simply supported RCC Beams for flexural failure
3. Testing of simply supported RCC beams for shear failure
4. Testing of RCC column
5. Non-destructive testing of concrete including rebound hammer and ultrasonic pulse method.
6. Permeability of concrete.
7. Vibration analysis of beams and plates.
8. Buckling load of struts.

Suggested Books:

1. A.M. Neville & J.J. Brooks, Concrete Technology, Pearson Education, Delhi, 2004.
2. A.R. Santhakumar, Concrete Technology, Oxford University Press, 2007, New Delhi.
3. Structural Engineering laboratory manual.

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III SEMESTER

MCE 321.1 Advance Steel Structures

(4-2-0)
Exam Hrs:-3
M.M.: -100+50 =150

Design of riveted and welded connections of flexible, semi-rigid and rigid types. Analysis of frames with semi-rigid connections. Design of industrial bents. Stressed Skin construction, Rigid frame design. Structural use of light gauge sections. Design of aluminium structures, special considerations. Three dimensional frame-works and their analysis and design. Design office methods of analysis of multi-storey frames. Cantilever, portal and continuous portal methods, effective lengths of framed columns, recent contributions by Merchant, Home and Wood. Structural systems for tall buildings: Frame, Shear wall, core wall, Frame-Shear wall/Core wall, Tubes systems e.g. tube in-tube, bundled tubes, braced tubes etc. to be dealt with in an elementary manner only.

Suggested Books:

1. Design of Metal Structures by K. Mukhanov
2. Design of steel structures by B Brester, Tylin and J B Scalzi,
3. Design of Steel Structures by P. Dayaratham,
4. I.S. Publications- IS: 800, IS: 875, IS: 801, IS: 811, IS: 3908, IS: 3921
5. I.S.I: Hand Book No. 1 and I.S.I: 5384

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MCE 321.2 Optimization in Structural analysis

(4-2-0)

Exam Hrs:-3

M.M.:-100+50 =150

Introduction to Optimization, Classical optimization Techniques, Single variable optimization, Multivariable Optimization with No Constraints/Equality Constraints/Inequality Constraints. Linear Programmemeing, Simplex Method. Non-Linear Programmemeing. One-Dimensional Minimization Methods. Constrained/unconstrained Optimization Techniques. Gradient methods for Non-Linear programmemeing, Geometric Programmemeing. Linear and Non-Linear Programmemeing Applications in Structural Design Optimal Control Theory for Multistage decision problems and Trusses Minimum Volume Design of Structures using structural Theorems Dynamic Programmemeing. Optimum Structural Design using Dynamic Programmemeing.

Suggested Books:

1. Introduction to Optimum Design by J.S. Arora, (Elsevier, 2nd edition 2004)
2. Optimization for Engineering Design, Algorithms and Examples by K. Deb., (Pentice Hall India 2006.)
3. Engineering Optimization theory and Practice by S.S. Rao, (New Age international Ltd. 3rd Edition, 1996 Reprint June 2008.)
4. Multi Objective Optimization using Evolutionary Algorithms by K. Deb., (John Wiley 2003)

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MCE 321.3 Design of Steel Bridges

(4-2-0)
Exam Hrs:-3
M.M.: -100+50 =150

Secondary stresses in steel Lattice bridge girders. Example of N Girder to be worked out using moment distribution method (for ordinary ties and struts and not for beams columns).

Design of modern deep plate girder bridges with high tensile steel. Orthotropic deck of steel and steel concrete composite construction. Guyon and Massonnet method for torsionless grillages as detailed by Morice and Towe. More recent modifications of the method by Cusens and Pama for inclusion of torsional rigidity of longitudinal girders.

Erection stresses during launching of girders. The example of the Ganga Bridge at Mokameh to be discussed from the paper by S.R. Sparkes in the Proceedings of the I.C.E. London in 1958.

Suggested Books:

1. Design of Metal Structures by K Mukhanov
2. Design of Steel Structure by B Bresler, Tylin and J.B. Scalsi,
3. Design of Steel Structure by P Dayaratham.
4. Design & Construction of Steel Bridges by Utpal Ghosh
5. Structural Analysis by R.C. Hibbeler
6. The Design of Steel Bridges by Kenneth Charles Rockey
7. The Design of Modern Steel Bridges by Sukhen Chatterjee
8. IRC – 6 -2010 – Standard Specifications & Code of Practice for Road Bridges. Sec. II, Section V.
9. IRC: 24-2010 Standard Specifications & Code of Practice for Road Bridges, Steel Road Bridges (Limit State Method)
10. IRC: SP: 4-1966 Bridge Code: Round the World.
11. IRC: SP: 37-2010 Guide lines for load carrying Capacity of Bridges
12. IRC: SP: 74-2010 Guide lines for Repair & Rehabilitation of Steel Bridges.
13. MORT&H Specification for Road & Bridge works, 2001.

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MCE 321.4 Composite Structures

(4-2-0)

Exam Hrs:-3

M.M.:-100+50 =150

Introduction: definition, Classification and characteristics of Composite materials, advantages and limitations, Current Status and Future prospects : Basic Concepts and characteristics: Homogeneity and Heterogeneity, Isotropy, Orthotropy and Anisotropy; Characteristics and configurations of lamina, laminate, micromechanics and macromechanics. Constituent materials and properties ; Elastic behavior of unidirectional lamina: Anisotropic, separately orthotropic and transversely isotropic materials, stress-strain relations for thin lamina, transformation of stress and strain, transformation of elastic parameters ; Strength of unidirectional lamina: Macromechanical failure theories- Maximum stress theory, maximum strain theory, Deviatoric strain energy theory (Tsai-Hill), Interactive tensor polynomial theory (Tsai-Wu ; Elastic Behavior of multidirectional laminates: Basic assumptions, Stress-strain relations, load deformation relations, symmetric and balanced laminates, laminate engineering properties ; Bending and vibration of laminated plates: Governing equations, Deflection of simply supported rectangular symmetric angle-ply, specially orthotropic, anti-symmetric cross-ply laminates ; Recent advance: Functionally graded materials, Smart materials.

Suggested Books:

1. Mechanics of Composite materials, by R.M. Jones, (Taylor and Francis, 1999.)
2. Engineering mechanics of Composite materials, by I.M. Daniel and O. Ishai, (Oxford university press, 1999)
3. Fiber-reinforced Composites, by P. K. Mallick, (Marcel Dekker Inc, 1988.)
4. An introduction to composite materials, by D. Hull and T. W.Clyne, (Cambridge University Press, Second Edition, 1996.)
5. Mechanics of laminated composite plates and shells-theory and Analysis, J.N. Reddy, (CRC Press, Boca Raton, Second Edition, 2003.)

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MCE 322.1 REPAIR AND REHABILITATION OF STRUCTURES

(4-2-0)

Exam Hrs:-3

M.M.:-100+50 =150

Introduction to Repair, Restoration and rehabilitation/strengthening of existing buildings. Causes of deterioration/decay and flexural & shear distress of concrete structures. Diagnostic methods & analysis, preliminary investigations, experimental investigations using NDT, load testing, corrosion mapping, core drilling and other instrumental methods. Cracks: structural & surface cracks, their identification & causes, methods of repair of small & large cracks: Guniting and Shot Crete, Epoxy injection, Mortar repair for cracks Corrosion mechanism: corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, cathodic protection. Strengthening of existing walls & RCC members, stitching, routing & Sealing, Jacketing Materials for Repair: Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferrocement, Fiber reinforced concrete. FRP wrap, banded plates. Numerical problems on strengthening of concrete structures using above materials & techniques.

Suggested Books.

1. Rehabilitation, Renovation and Repairs of Structures – Indian Concrete Institute
2. Rehabilitation & Repairs of Structure – Indian Concrete Institute
3. Repair & Rehabilitation A compilation from Indian Concrete Journal
4. Repair & Rehabilitation of Buildings by Sushil K. Dhawan
5. Rehabilitation of Concrete Structures by Dr. B. Vidivelli
6. Bridge & Highway Structure Rehabilitation & Repair by Mohinuddin A.Khan
7. Hand book on Repair & Rehabilitation of Structures-CPWD, Delhi
8. Concrete Technology by M.S. Shetti
9. Damage Assessment & Repair in Low Cost Housing RHDC – NBO, July 1992.

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MCE 322.2 Disaster Mitigation and Earthquake Engineering

(4-2-0)

Exam Hrs:-3

M.M.:-100+50 =150

Natural Disasters: Earthquake, Floods, Drought, Coastal Hazards, Landslides, rockslides and Forest Fires. Elements of Engineering Seismology: Earthquake Phenomenon, Earthquake recording instruments. Introduction to Theory of Vibrations: Single degree un-damped and damped systems, elastic response to simple load functions and earthquake response spectras. Performance of Buildings and Structures: Main causes of damage: Intensity of earthquake forces, lack of strength and integrity in buildings, quasi- resonance, lack of ductility, lack of detailing. Earthquake Effects: On ground and soil liquefaction, buildings, structures, power plants, switch yards, equipments and other lifeline structures, release of poisonous gases and radiation. Lessons Learnt from the Past Earthquakes: Case studies of important Indian earthquakes and major world earthquakes. Disaster Management: Salient features of disaster rescue, risk management and casualty management.

Suggested Books:

1. 'Disaster Management' by Dr. Indu Prakash., (Rashtra Prahari Prakashan, Sahibabad, Gaziabad)
2. 'A Text Book of Geology' by P.K. Mukherjee,
3. 'Elements of Earthquake Engg; by Jaikrishna, Chandrasekharan and B.Chandra, (South Asian Publishers, New Delhi.)
4. 'Manual of Seismic Design' by James L. Stratta, (Pearson Education, Singapore.)
5. 'Introduction to Earthquake Analysis and Design' by V.K. Manickaselvam, (Dhanpat Rai Publications.)

Jodhpur National University
M.Tech. Programme, CIVIL (Structural Engineering)
TEACHING/EXAMINATION SCHEME

MCE 322.3 ADVANCED FOUNDATION DESIGN

(4-2-0)
Exam Hrs:-3
M.M.: -100+50 =150

Critical study of conventional methods of foundation design, Analysis of settlement of soil and foundations, foundations of in expansive and swelling soils, Dynamic soil properties, dynamic bearing capacity of shallow foundations, liquefaction of soils, Machine foundations for reciprocating and rotary type machines, vibration isolation. Raft foundations, well foundations, special footings and beams on elastic foundations,

Suggested Books:

1. 'Construction and Foundation Engineering' by J.Jha.
2. Design of Foundation Systemis by Nainan P Kurian
3. Design of Reinforced Concrete foundation by P.C. Verghese
4. Foundation Analysis and Design by Joseph E. Bowles, Mc Graw Hill Inc. Second Edition.
5. Foundation Design in Practice by Karuna Moy and Ghosh
6. Foundation Engineering. Pech, Hansen and Thmburn.
7. Mechanics and foundation Engineering, Vol II V.N.S. Murthy.

Jodhpur National University
M.Tech. Programme, CIVIL (Structural Engineering)
TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 322.4 Ground Improvement Techniques

(4-2-0)

Exam Hrs:-3

M.M.:-100+50 =150

Need and objectives of Ground Improvement, Classification of Ground Modification Techniques- suitability and feasibility, Emerging Trends in ground improvement. Methods of compaction, Shallow compaction, Deep compaction techniques -Vibro floatation, Blasting, Dynamic consolidation, pre-compression and compaction piles, Field compaction control. Methods of dewatering - open sumps and ditches, Wellpoint system, Electro-osmosis, Vacuum dewatering wells; pre-loading without and with sand drains, strip drains and rope drains. Stabilisation with admixtures like cement, lime, calcium chloride, fly ash and bitumen. Categories of grouting, Art of grouting, Grout materials, Grouting techniques and control. Concept of soil reinforcement, Reinforcing materials, Concept of confinement, Gabbion walls,

Suggested Books ; _

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

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TEACHING/EXAMINATION SCHEME & SYLLABUS

MCE 323 Seminars (On any Contemporary Topic)

(0- 0- 6)
M.M.:- 100

In this course, the concepts on specific contemporary topic of structural Engineering will be studied and tools for preparing reports will be used by the students to prepare report. Reporting, writing and presentation skill development is the main objective of the seminar.

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IV SEMESTER

MCE 421 Dissertations

M.M.:- 200