

ORDINANCE No. V (42A) (B11)
Master of Technology (M.Tech)
Structural Engineering
(Syllabus Effective From 2023-24)



BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF CIVIL ENGINEERING
(FACULTY OF ENGINEERING AND TECHNOLOGY)

Swami Vivekanand Subharti University Meerut, Uttar Pradesh
(Established under the UP Act No. 29 of 2008 & approved under Section 2 (f) of UGC Act, 1956)



SUBHARTI INSTITUTE OF TECHNOLOGY & ENGINEERING
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-I

Branch/Course: Civil Engineering/M.Tech(SE)

w.e.f academic Session 2023-24

Sl. No.	Course Code	Course Title	Course Type	Period			CCA				ESE Marks		Total	Credits
				L	T	P	CT	AT	Total	PS	TE	PE		
1	MSE-101	Advanced Structural Analysis	PCC-1	3	0	0	20	10	30	-	70	-	100	3
2	MSE-102	Advanced Solid Mechanics	PCC-2	3	0	0	20	10	30	-	70	-	100	3
3	MSE-(111-113)	Elective – I	PE-1	3	0	0	20	10	30	-	70	-	100	3
4	MSE-(121-123)	Elective – II	PE-2	3	0	0	20	10	30	-	70	-	100	3
5	MSE-151	Structural Design Lab	PCC-3	0	0	2	-	-	-	15	-	35	50	2
6	MSE-152	Advanced Concrete Lab	PCC-4	0	0	2	-	-	-	15	-	35	50	2
7	METC 101	Research Methodology and IPR	MC-1	2	0	0	20	10	30	-	70	-	100	2
8	METC (111-118)	Audit Course -I	MC-2	2	0	0	20	10	30	-	70	-	100	0
TOTAL													700	18

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SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-II

Branch/Course: Civil Engineering/M.Tech(SE)
w.e.f academic Session 2023-24

Sl. No.	Course Code	Course Name	Course Type	Period			CCA				ESE Marks			TOTAL	Credit
				L	T	P	CT	AT	Total	PS	TE	PE			
1	MSE-201	FEM in Structural Engineering	PCC-5	3	0	0	20	10	30	-	70	-	100	3	
2	MSE-202	Structural Dynamics	PCC-6	3	0	0	20	10	30	-	70	-	100	3	
3	MSE-(211-214)	Elective – III	PE-3	3	0	0	20	10	30	-	70	-	100	3	
4	MSE-(221-224)	Elective – IV	PE-4	3	0	0	20	10	30	-	70	-	100	3	
5	MSE-251	Model Testing Lab	PCC-7	0	0	2	-	-	-	15	-	35	50	2	
6	MSE-252	Numerical Analysis Lab	PCC-8	0	0	2	-	-	-	15	-	35	50	2	
7	MSE-253	Mini Project	PCC-9	0	0	4	-	-	-	50	-	50	100	2	
8	METC (211-218)	Audit Course -2	MC-3	2	0	0	20	10	30	-	70	-	100	0	
Total													700	18	

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STUDY & EVALUATION SCHEME**

YEAR 2nd, SEMESTER-III

Branch/Course: Civil Engineering/M.Tech(SE)
w.e.f academic Session 2023-24

Sl. No.	Course Code	Course Name	Course Type	Period			CCA				ESE MARKS		TOTAL	Credits
				L	T	P	CT	AT	Total	PS	TE	PE		
1	MSE-(311-314)	Elective - V	PE-5	3	0	0	20	10	30	-	20	10	100	3
2	MSE-(001-006)	Open Elective -1	OPC-1	3	0	0	20	10	30	-	20	10	100	3
3	MSE-351	Dissertation Phase - I	PROJ-1	0	0	2	-	-	-	50	-	150	200	10
Total												400	16	

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STUDY & EVALUATION SCHEME**

YEAR 2nd, SEMESTER-IV

Branch/Course: Civil Engineering/M.Tech(SE)
w.e.f academic Session 2023-24

Sl. No.	Course Code	Course Name	Course Type	Period			CCA				ESE MARKS		TOTAL	Credits
				L	T	P	CT	AT	Total	PS	TE	PE		
1	MSE-451	Dissertation Phase - II	PROJ-2	0	0	32	-	-	-	100	-	200	300	16
Total												300	16	

M.TECH. (SE) GRAND TOTAL CREDITS – 68

M.TECH. (Structural Engineering)

W.E.F. ACADEMIC SESSION 2023-24

LIST OF ELECTIVES, OPEN ELECTIVES AND MANDATORY COURSES

COURSE TYPE NOMENCLATURE

Course Code	Definitions
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management courses
PCC	Professional core courses
PE	Professional Elective
OE	Open Elective
MC	Mandatory courses
PROJ	Project
CCA	Continuation Comprehensive Assessment
ESE	End Semester Examination
CT	Class test
AT	Attendance test
PS	Practical sessional
TE	Theory exam
L	Lecture
T	Tutorial
P	Practical

PROGRAM CORE COURSE (PCC)

Code	Subject Name
MSE-101	1. Advanced Structural Analysis
MSE-102	2. Advanced Solid Mechanics
MSE-151	3. Structural Design Lab
MSE-152	4. Advanced concrete lab
MSE-201	5. FEM in structural engineering
MSE-202	6. Structural Dynamics
MSE-251	7. Model Testing Lab
MSE-252	8. Numerical Analysis Lab
MSE-253	9. Mini Project

Program Elective – 1 (PE-1)

Code	Subject Name
MSE-111	10. Theory of Thin Plates and Shells
MSE-112	11. Theory and Applications of Cement Composites
MSE-113	12. Theory of Structural Stability

Program Elective – 2 (PE-2)

Code	Subject Name
MSE-121	1. Analytical and Numerical Methods for Structural Engineering
MSE-122	2. Structural Health Monitoring
MSE-123	3. Structural Optimization

Program Elective – 3 (PE-3)

Code	Subject Name
MSE-211	1. Advanced Steel Design
MSE-212	2. Design of Formwork
MSE-213	3. Design of High Rise Structures
MSE-214	4. Design of Masonry Structures

Program Elective – 4 (PE-4)

Code	Subject Name
MSE-221	1. Design of Advanced Concrete Structures
MSE-222	2. Advanced Design of Foundations
MSE-223	3. Soil Structure Interaction
MSE-224	4. Design of Industrial Structure

Program Elective – 5 (PE-5)

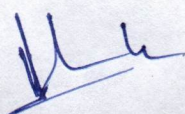
Code	Subject Name
MSE-311	1. Design of Prestressed Concrete Structures
MSE-312	2. Analysis of Laminated Composite Plates
MSE-313	3. Fracture Mechanics of Concrete Structures
MSE-314	4. Design of Plates and Shells

Open Elective Course – 1(OPC-1)

Code	Subject Name
MSE-001	1. Business Analytics
MSE-002	2. Industrial Safety
MSE-003	3. Operations Research
MSE-004	4. Cost Management of Engineering Projects
MSE-005	5. Composite Materials
MSE-006	6. Waste to Energy

**MANDATORY COURSES (MC)
AUDIT COURSE I & II**

Code	Subject Name
METC-111/METC-211	1. English for Research Paper Writing
METC-112/METC-212	2. Disaster Management
METC-113/METC-213	3. Sanskrit for Technical Knowledge
METC-114/METC-214	4. Value Addition
METC-115/METC-215	5. Constitution of India
METC-116/METC-216	6. Pedagogy Studies
METC-117/METC-217	7. Stress Management by Yoga
METC-118/METC-218	8. Personality Development through Life Enlightenment Skills.
METC-101	9. Research methodology and IPR



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SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-I

Branch/Course: Structural Engineering/M.Tech(SE)

Program Outcomes :

After completion of the program graduates will be able to

- Apply the knowledge of science, mathematics, and engineering principles for developing problem solving attitude
- Identify, formulate and solve engineering problems in the domain of structural engineering field.
- Use different software tools for Analysis and Design structural engineering domain.
- Design and conduct experiments, analyse and interpret data, for development of simulation experiments.
- Function as a member of a multidisciplinary team with sense of ethics, integrity and social responsibility.

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STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-I

Branch/Course: Civil Engineering/M.Tech(SE)

MSE-101 - Advanced Structural Analysis (Credits - 3:0:0 = 3)

Teaching Scheme

Lectures: 3hrs/week

Course objective :

- To impart knowledge of analysing beam and framed structure.
- To develop analytical skill of solving beams and trusses using influence line
- To impart analysing axial bars and beams using galarkins method and Rayleigh Ritz method.

Syllabus Contents:

UNIT-1: Linear Element: Shape Functions, Solution for Poisson's Equation, General One Dimensional Equilibrium Problem.

UNIT-2: Boundary Value Problems (BVP): Approximate Solution of Boundary Value Problems, Modified Galerkin Method for One-Dimensional BVP, Matrix Formulation of the Modified Galerkin Method.

UNIT-3: Applications to Simple Problems: Beams, Plane Trusses, Plane Rigid Jointed Frames and Grids by Structure Approach and Member Approach.

UNIT-4: Stiffness Method applied to Large Frames: Local Coordinates and Global Coordinates. **Stiffness Matrix Assembly of Structures:** Stiffness Matrix in Global Coordinates, Boundary Conditions, Solution of Stiffness Matrix Equations, Calculation of Reactions and Member Forces.

UNIT-5: Influence Coefficients: Physical Significance, Effects of Settlements, Temperature Change and Lack of Fit, Member Approach and Structure Approach.

Course outcomes: At the end of the course, students will be able to

- Analyze the skeleton structures using stiffness analysis code.
- Use direct stiffness method understanding its limitations

References:

- Matrix Analysis of Framed Structures, Weaver and Gere.
- The Finite Element Method, Lewis P. E. and Ward J. P., Addison-Wesley Publication Co.
- Computer Methods in Structural Analysis, Meek J. L., E and FN, Span Publication.
- The Finite Element Method, Desai and Able, CBS Publication

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STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-I

Branch/Course: Civil Engineering/M.Tech(SE)

MSE-102 - Advanced Solid Mechanics (Credits - 3:0:0 = 3)

Teaching Scheme

Lectures:3hrs/week

Course objective:

- Understanding of the scope ,principle, norms ,accountabilities and bound of contemporary engineering practice in the specific discipline.
- Application of Established engineering method to complex engineering problem solving
- Fluent application of engineering technique ,tool and resources.

Syllabus Contents:

UNIT-1: Plastic Deformation: Strain Hardening, Idealized Stress- Strain curve, Yield Criteria, von Mises Yield Criterion, Tresca Yield Criterion, Plastic Stress-Strain Relations, Principle of Normality and Plastic Potential, Isotropic Hardening.

UNIT-2: Equations of Elasticity: Equations of Equilibrium, Stress- Strain relations, Strain Displacement and Compatibility Relations, Boundary Value Problems, Co-axiality of the Principal Directions.

UNIT-3: Two-Dimensional Problems of Elasticity: Plane Stress and Plane Strain Problems; Airy's stress Function, Two-Dimensional Problems in Polar Coordinates.

UNIT-4: Torsion of Prismatic Bars: Saint Venant's Method, Prandtl's Membrane Analogy, Torsion of Rectangular Bar, Torsion of Thin Tubes.

UNIT-5: Introduction to Elasticity: Displacement, Strain and Stress Fields, Constitutive Relations, Cartesian Tensors and Equations of Elasticity

Course outcomes: At the end of the course, students will be able to

- Solve simple problems of elasticity and plasticity understanding the basic concepts.
- Apply numerical methods to solve continuum problems.

References:

- Theory of Elasticity, Timoshenko S. and Goodier J. N., McGraw Hill, 1961.
- Elasticity, Sadd M.H., Elsevier, 2005.
- Engineering Solid Mechanics, Ragab A.R., Bayoumi S.E., CRC Press, 1999.

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STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-I

Branch/Course: Civil Engineering/M.Tech(SE)

MSE-111 - Theory of Thin Plates and Shells (Credits - 3:0:0 = 3)

Teaching Scheme

Lectures: 3hrs/week

Course Objective:

- To provide an elementary knowledge of mechanism of material and mathematics
- To provide simple and comprehensive mathematical analysis of plate theories and there application to plate bending problem
- To provide a knowledge of fundamental of theory of shell and folded plates

Syllabus Contents:

UNIT-1: Circular Plates: Analysis under Axi- Symmetric Loading, Governing Differential Equation in Polar Co-ordinates. Approximate Methods of Analysis- Rayleigh-Ritz approach for Simple Cases in Rectangular Plates.

UNIT-2: Shells of Revolution: with Bending Resistance - Cylindrical and Conical Shells, Application to Pipes and Pressure Vessels. Thermal Stresses in Plate/ Shell.

UNIT-3: Static Analysis of Plates: Governing Equation for a Rectangular Plate, Navier Solution for Simply- Supported Rectangular Plate under Various Loadings, Levy solution for Rectangular Plate with other Boundary Conditions.

UNIT-4: Static Analysis of Shells: Membrane Theory of Shells - Cylindrical, Conical and Spherical Shells.

UNIT-5: Introduction: Space Curves, Surfaces, Shell Co-ordinates, Strain Displacement Relations, Assumptions in Shell Theory, Displacement Field Approximations, Stress Resultants, Equation of Equilibrium using Principle of Virtual Work, Boundary Conditions.

Course Outcomes:

At the end of the course, students will be able to

- Use analytical methods for the solution of thin plates and shells.
- Use analytical methods for the solution of shells.
- Apply the numerical techniques and tools for the complex problems in thin plates.
- Apply the numerical techniques and tools for the complex problems in shells.

References:

- Theory of Plates and Shells, Timoshenko S. and Krieger W., McGraw Hill.
- Stresses in Plates and Shells, Ugural Ansel C., McGraw Hill.
- Thin Elastic Shells, Kraus H., John Wiley and Sons.
- Design and Construction of Concrete Shells, Ramaswamy G.S.

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STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-I

Branch/Course: Civil Engineering/M.Tech(SE)

MSE-112 - Theory and Applications of Cement Composites(Credits3:0:0=3)

Teaching Scheme

Lectures: 3 hrs/week

Course Objective:

- To provide knowledge about cement composites material.
- Student aware about the basic mechanical property of the material
- To study mechanical behavior of the material

Syllabus Content:

UNIT-1: Analysis and Design of Cement Composite Structural Elements – Ferro cement, SIFCON and Fiber Reinforced Concrete.

UNIT-2: Mechanical Behavior: Mechanics of Materials Approach to Stiffness- Determination of Relations between Elastic Constants, Elasticity Approach to Stiffness- Bounding Techniques of Elasticity, Exact Solutions - Elasticity Solutions with Continuity, Halpin, Tsai Equations, Comparison of approaches to Stiffness.

UNIT-3: Application of Cement Composites: FRC and Ferro cement- Housing, Water Storage, Boats and Miscellaneous Structures. Composite Materials- Orthotropic and Anisotropic behavior, Constitutive relationship, Elastic Constants.

UNIT-4: Mechanical Properties of Cement Composites: Behavior of Ferro cement, Fiber Reinforced Concrete in Tension, Compression, Flexure, Shear, Fatigue and Impact, Durability and Corrosion.

UNIT-5: Cement Composites: Types of Cement Composites, Terminology, Constituent Materials and their Properties, Construction Techniques for Fiber Reinforced Concrete – Ferro cement, SIFCON, Polymer Concretes, Preparation of Reinforcement, Casting and Curing.

UNIT-6: Introduction to composite Materials : Classification and Characteristics of Composite Materials- Basic Terminology, Advantages. Stress-Strain Relations- Orthotropic and Anisotropic Materials, Engineering Constants for Orthotropic Materials, Restrictions on Elastic Constants, Plane Stress Problem, Biaxial Strength, Theories for an Orthotropic Lamina.

Course Outcomes:

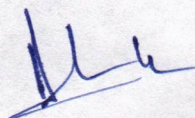
At the end of the course, students will be able to

- Formulate constitutive behavior of composite materials – Ferro cement, SIFCON and Fiber Reinforced Concrete - by understanding their strain- stress behavior.
- Classify the materials as per orthotropic and anisotropic behavior.

- Estimate strain constants using theories applicable to composite materials.
- Analyse and design structural elements made of cement composites.

Reference Books:

- Mechanics of Composite Materials, Jones R. M., 2nd Ed., Taylor and Francis, BSP Books, 1998.
- Ferro cement – Theory and Applications, Pama R. P., IFIC, 1980.
- New Concrete Materials, Swamy R.N., 1stEd., Blackie, Academic and Professional, Chapman & Hall, 1983.



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STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-I

Branch/Course: Civil Engineering/M.Tech(SE)

MSE-113 - Theory of Structural Stability (Credits- 3:0:0 = 3)

Teaching Scheme

Lectures: 3

hrs/week

Course Objective:

- To impart sufficient knowledge about basic concepts of elastic structural stability, analytical approaches to stability and analysis of inelastic buckling of columns.
- To expose the students to stability analysis of beam columns and frames using FEM and other methods and analysis of buckling of beams and thin plates.

Syllabus Contents:

UNIT-1: Introduction to Inelastic Buckling and Dynamic Stability.

UNIT-2: Stability of Columns: Axial and Flexural Buckling, Lateral Bracing of Columns, Combined Axial, Flexural and Torsion Buckling.

UNIT-3: Stability of Frames: Member Buckling versus Global Buckling, Slenderness Ratio of Frame Members.

UNIT-4: Stability of Beams: lateral torsion buckling. **Stability of Plates:** axial flexural buckling, shear flexural buckling, buckling under combined loads. □

UNIT-5: Criteria for Design of Structures: Stability, Strength, and Stiffness, Classical Concept of Stability of Discrete and Continuous Systems, Linear and nonlinear behavior

Course Outcomes:

At the end of the course, students will be able to

- Determine stability of columns and frames
- Determine stability of beams and plates
- Use stability criteria and concepts for analyzing discrete and continuous systems,

Reference Books:

- Theory of elastic stability, Timoshenko and Gere, Tata Mc Graw Hill, 1981
- Principles of Structural Stability Theory, Alexander Chajes, Prentice Hall, New Jersey.
- Structural Stability of columns and plates, Iyengar, N. G. R., Eastern west press Pvt. Ltd.
- Strength of Metal Structures, Bleich F. Bucking, Tata McGraw Hill, New York

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STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-I

Branch/Course: Civil Engineering/M.Tech(SE)

MSE-121 – Analytical and Numerical Methods for Structural Engineering
(Credits - 3:0:0 = 3)

Teaching Scheme

Lectures: 3

hrs/week

Course objective:

- Student aware about numerical solution for different structural problem.
- Student gets knowledge about fundamental of numerical techniques.

Syllabus Contents:

UNIT-1: Computer Algorithms: Numerical Solutions for Different Structural Problems, Fuzzy Logic and Neural Network

UNIT-2: Finite Difference scheme: Implicit & Explicit scheme

UNIT-3: Numerical Differentiation & Integration: Solution of Ordinary and Partial Differential Equations.

UNIT-4: Solution of Nonlinear Algebraic and Transcendental Equations Elements of Matrix Algebra: Solution of Systems of Linear Equations, Eigen Value Problems.

UNIT-5: Fundamentals of Numerical Methods: Error Analysis, Polynomial Approximations and Interpolations, **Curve Fitting;** Interpolation and extrapolation.

Course Outcomes:

At the end of the course, students will be able to

- Solve ordinary and partial differential equations in structural mechanics using numerical methods.
- Write a program to solve a mathematical problem.

Reference Books:

- An Introduction to Numerical Analysis, Atkinson K.E., J. Wiley and Sons, 1989.
- Theory and Problems of Numerical Analysis, Scheid F, McGraw Hill Book Company, (Shaum Series), 1988.
- Introductory Methods of Numerical Analysis, Sastry S. S, Prentice Hall of India, 1998.

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STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-I

Branch/Course: Civil Engineering/M.Tech(SE)

MSE-122 – Structural Health Monitoring (Credits - 3:0:0 = 3)

Teaching Scheme

Lectures:3hrs/week

Course objective:

- Student knows about how to assess the health of structure using dynamic field tests.
- Student able to know repairs and rehabilitation measures of the structure

Syllabus Contents:

UNIT-1: Introduction to Repairs and Rehabilitations of Structures: Case Studies (Site Visits), piezo-electric materials and other smart materials, electro-mechanical impedance (EMI) technique, adaptations of EMI technique

UNIT-2: Dynamic Field Testing: Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.

UNIT-3: Static Field Testing: Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement.

UNIT-4: Structural Audit: Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures

UNIT-5: Structural Health: Factors affecting Health of Structures, Causes of Distress, Regular Maintenance. Structural Health Monitoring: Concepts, Various Measures, Structural Safety in Alteration.

Course Outcomes:

At the end of the course, students will be able to

- Diagnosis the distress in the structure understanding the causes and factors.
- Assess the health of structure using static field methods.

Reference Books:

- Structural Health Monitoring, Daniel Balageas, Claus Peter Fritzen, Alfredo Güemes, John Wiley and Sons, 2006.
- Health Monitoring of Structural Materials and Components Methods with Applications, Douglas E Adams, John Wiley and Sons, 2007.
- Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z. D. Duan, Taylor and Francis Group, London, UK, 2006.
- Structural Health Monitoring with Wafer Active Sensors, Victor Giurgutiu, Academic Press Inc, 2007.

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STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-I

Branch/Course: Civil Engineering/M.Tech(SE)

MSE-123 – Structural Optimization (Credits - 3:0:0 = 3)

Teaching Scheme

Lectures: 3

hrs/week

Course objective:

- To impart knowledge about linear, integer programming.
- To apply theoretical concept in the field.

Syllabus Contents:

- **Introduction:** Simultaneous Failure Mode and Design, Classical External Problems.
- **Calculus of Variation:** Variational Principles with Constraints,
- **Linear Programming,** Integer Programming, Nonlinear Programming, Dynamic Programming,
- **Geometric Programming and Stochastic Programming.**
- **Applications:** Structural Steel and Concrete Members, Trusses and Frames.
- **Design:** Frequency Constraint, Design of Layouts.

Course Outcomes:

At the end of the course, students will be able to

- Use Variational principle for optimization
- Apply optimization techniques to structural steel and concrete members.
- Design using frequency constraint.

Reference Books:

- Elements of Structural Optimization, Haftka, Raphael T., Gürdal, Zafer, Springer.
- Variational methods for Structural optimization, Cherkaev Andrej, Springer

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YEAR 1st, SEMESTER-I

Branch/Course: Civil Engineering/M.Tech(SE)

MSE-151 – Structural Design Lab (Credits - 0:0:4= 2)

Teaching

Scheme

Lab: 2 hrs/week

Course Outcomes:

At the end of the course, students will be able to

1. Design and Detail all the Structural Components of Frame Buildings.
2. Design and Detail complete Multi-Storey Frame Buildings.

Syllabus Content:

Design and detailed drawing of complete G+ 3 structures by individual student using latest relevant IS codes.

MSE-152 – Advanced Concrete Lab (Credits - 0:0:4 = 2)

Teaching

Scheme Lab: 2

hrs/week

Course Outcomes:

At the end of the course, students will be able to

1. Design high grade concrete and study the parameters affecting its performance.
2. Conduct Non Destructive Tests on existing concrete structures.
3. Apply engineering principles to understand behavior of structural/ elements.

List of Experiments/Assignments:

1. Study of stress-strain curve of high strength concrete, Correlation between cube strength, cylinder strength, split tensile strength and modulus of rupture.
2. Effect of cyclic loading on steel.
3. Non-Destructive testing of existing concrete members.
4. Behavior of Beams under flexure, Shear and Torsion.

Reference Books:

- Properties of Concrete, Neville A. M., 5th Edition, Prentice Hall, 2012.
- Concrete Technology, Shetty M. S., S. Chand and Co., 2006.



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STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-I

Branch/Course: Civil Engineering/M.Tech(SE)

METC-101 Research Methodology and IPR (Credits - 2:0:0 = 2)

Teaching Scheme

Lectures: 2 hrs/week

Course objective:

- Understand research problem formulation.
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity

Syllabus Contents:

- **Unit 1:** Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.
- **Unit 2:** Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee
- **Unit 3:** Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.
- **Unit 4:** Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.
- **Unit 6:** New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Course Outcomes:

At the end of this course, students will be able to

- Analyze research related information
- Follow research ethics.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-II

Branch/Course: Civil Engineering/M.Tech(SE)

METC-112 – Disaster management (Credits- 2:0:0 = 0)

Teaching Scheme

Lectures: 2hrs/week

Course Objectives: -Students will be able to:

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Syllabus Contents:

Unit 1: Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude

Unit 2: Disaster Preparedness And Management

Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

Unit 3 : Risk Assessment Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival. Disaster Mitigation, Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India

Unit 4 : Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

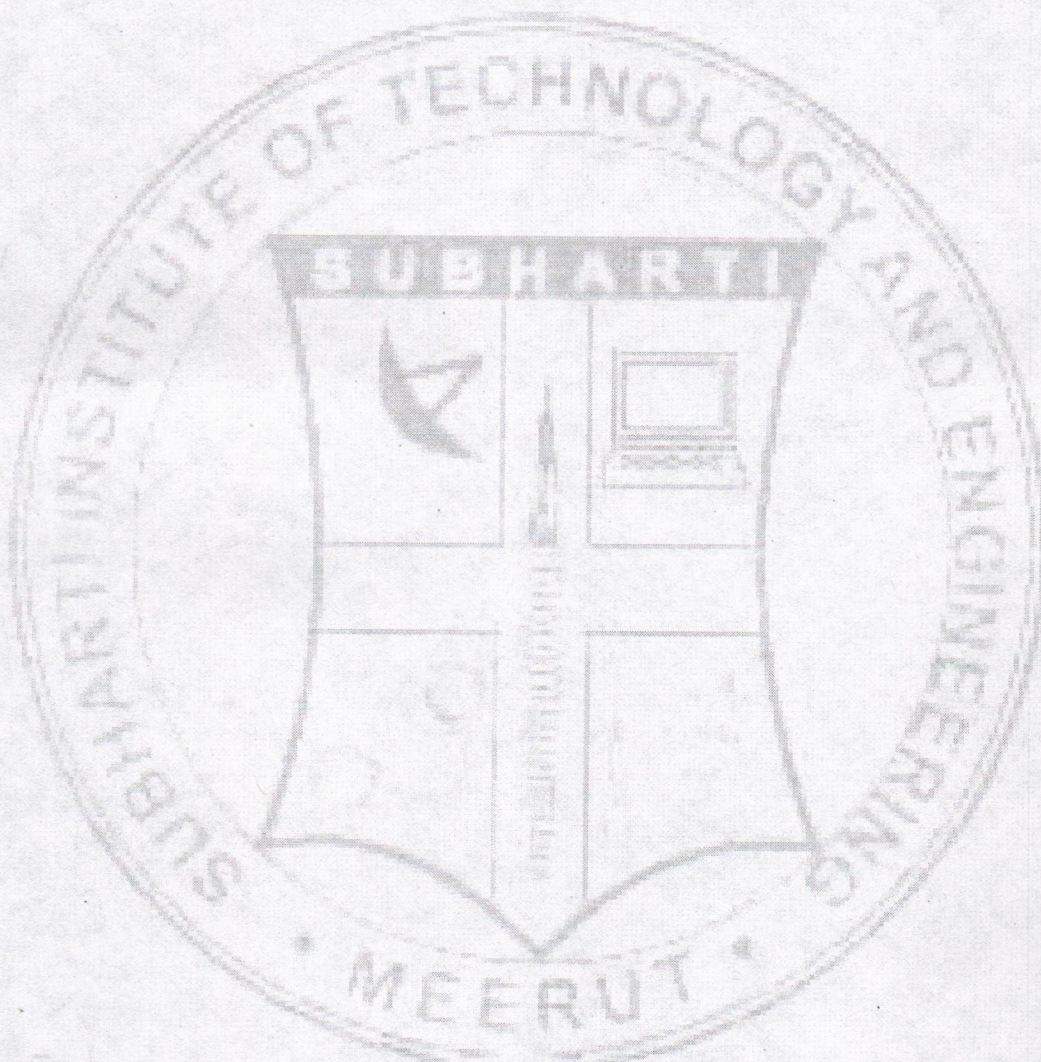
Unit 5 : Disaster Prone Areas In India Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics.

Course Outcomes: At the end of this course, students will

1. achieve knowledge on the types of hazards and disasters, disaster prevention strategy, early warning system, disaster mitigation and preparedness.
2. have the capacity to participate in the socio-economical response of human resource development and relate to risk transfer.

References:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi.



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SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-II

Branch/Course: Civil Engineering/M.Tech(SE)

MSE-201 - Finite Element Method in Structural Engineering(Credits- 3:0:0 = 3)

Teaching Scheme

Lectures: 3 hrs/week

Course Objectives:

- To learn basic principles of finite element analysis procedure .
- To learn the theory and characteristics of finite elements that represent engineering structures.
- To learn and apply finite element solutions to structural, thermal, dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyses performed by others.

Syllabus Contents:

UNIT-1: Introduction: History and Applications. Spring and Bar Elements, Minimum Potential Energy Principle, Direct Stiffness Method, Nodal Equilibrium equations, Assembly of Global Stiffness Matrix, Element Strain and Stress.

UNIT-2: Application to Solid Mechanics: Plane Stress, CST Element, Plane Strain Rectangular Element, Isoparametric Formulation of the Plane Quadrilateral Element, Axi-Symmetric Stress Analysis, Strain and Stress Computations. **Computer Implementation** of FEM procedure, Pre-Processing, Solution, Post-Processing, Use of Commercial FEA Software

UNIT-3: Types: Triangular Elements, Rectangular Elements, Three-Dimensional Elements, Isoparametric Formulation, Axi-Symmetric Elements, Numerical Integration, Gaussian Quadrature.

UNIT-4: Beam Elements: Flexure Element, Element Stiffness Matrix, Element Load Vector

UNIT-5: Method of Weighted Residuals: Galerkin in Finite Element Method, Application to Structural Elements, Interpolation Functions, Compatibility and Completeness Requirements, Polynomial Forms, Applications..

Course Outcomes:

At the end of the course, students will be able to

- Use Finite Element Method for structural analysis.
- Execute the Finite Element Program/ Software.
- Solve continuum problems using finite element analysis.

Reference Books:

- Finite Element Analysis, Seshu P., Prentice-Hall of India,2005.
- Concepts and Applications of Finite Element Analysis, Cook R. D., Wiley J., New York, 1995.
- Fundamentals of Finite Element Analysis, Hutton David, Mc-Graw Hill, 2004.
- Finite Element Analysis, Buchanan G.R., McGraw Hill Publications, New York, 1995.
- Finite Element Method, Zienkiewicz O.C. & Taylor R.L. Vol. I, II & III, Elsevier, 2000.
- Finite Element Methods in Engineering, Belegundu A.D., Chandrupatla, T.R., Prentice Hall India, 1991.

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-II

Branch/Course: Civil Engineering/M.Tech(SE)

MSE-202 – Structural Dynamics (Credits - 3:0:0 = 3)

Teaching Scheme

Lectures: 3 hrs/week

Course Objective:

- To impart knowledge about theory of vibrations and vibration parameters to analyse the dynamic forces caused by an earthquake.
- To introduce the design of buildings for blast and impact forces as per BIS codes of practice.

Syllabus Contents:

UNIT-1: Introduction: Objectives, Importance of Vibration Analysis, Nature of Exciting Forces, Mathematical Modeling of Dynamic Systems.

UNIT-2: Single Degree of Freedom System: Free and Forced Vibration with and without Damping, Response to Harmonic Loading, Response to General Dynamic Loading using Duhamel's Integral, Fourier Analysis for Periodic Loading, State Space Solution for Response, **Numerical Solution** to Response using Newmark Method and Wilson Method, Numerical Solution for State Space Response using Direct Integration.

UNIT-3: Multiple Degree of Freedom System (Lumped parameter): Two Degree of Freedom System, Multiple Degree of Freedom System, Inverse Iteration Method for Determination of Natural Frequencies and Mode Shapes, Dynamic Response by Modal Superposition Method, Direct Integration of Equation of Motion.

UNIT-4: Multiple Degree of Freedom System (Distributed Mass and Load): Single Span Beams, Free and Forced Vibration, Generalized Single Degree of Freedom System.

UNIT-4: Special Topics in Structural Dynamics (Concepts only): Dynamic Effects of Wind Loading, Moving Loads, Vibrations caused by Traffic, Blasting and Pile Driving, Foundations for Industrial Machinery, Base Isolation.

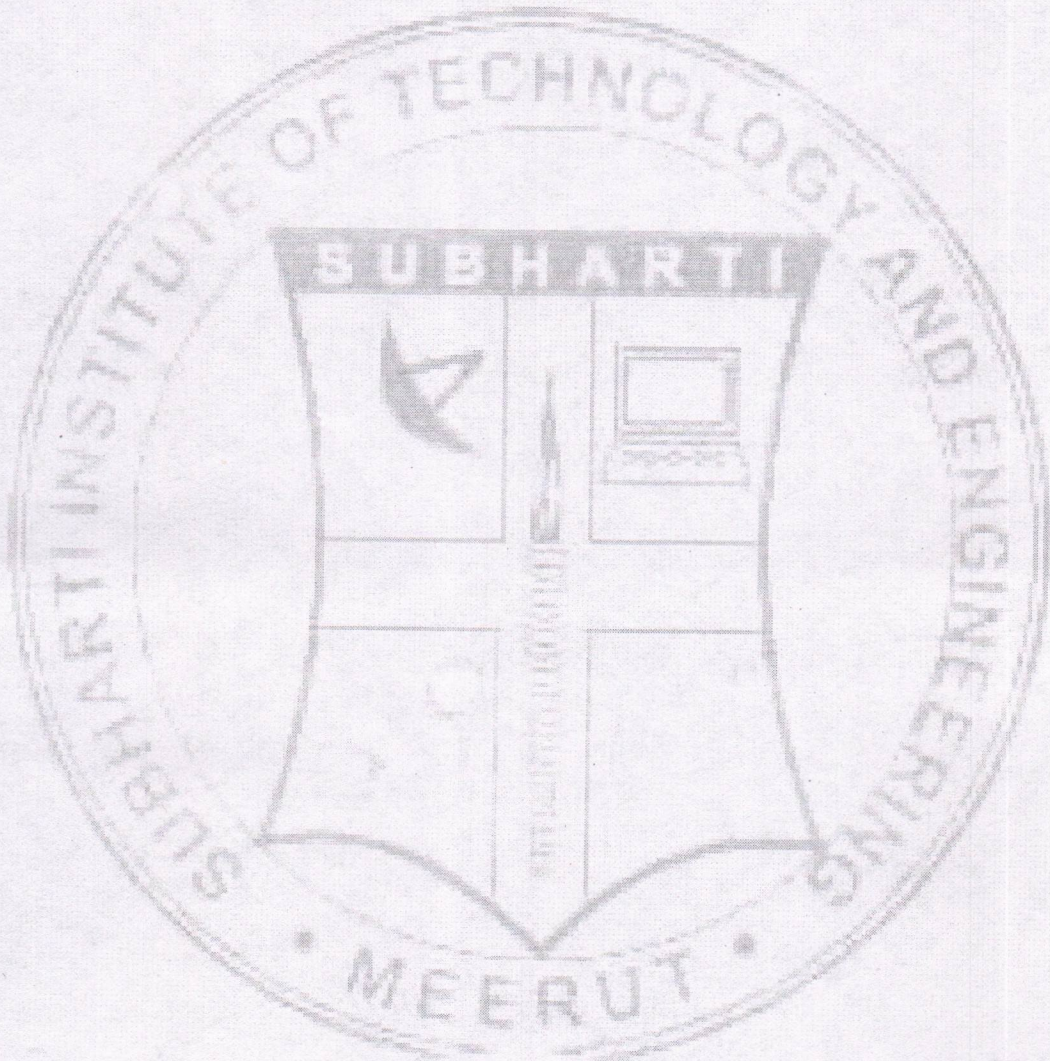
Course Outcomes:

At the end of the course, students will be able to

- Analyze and study dynamics response of single degree freedom system using fundamental theory and equation of motion.
- Analyze and study dynamics response of Multi degree freedom system using fundamental theory and equation of motion.
- Use the available software for dynamic analysis.

Reference Books:

- Dynamics of Structures, Clough R. W. and Penzien J., Mc Graw Hill.
- Structural Dynamics and Introduction to Earthquake Engineering, Chopra A. K.
- Vibration of Structures - Application in Civil Engineering Design, Smith J. W., Chapman and Hall.
- Dynamics of Structures, Humar J. L., Prentice Hall.
- Structural Dynamics - Theory and Computation, Paz Mario, CBS Publication.
- Dynamics of Structures, Hart and Wong.



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SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-II

Branch/Course: Civil Engineering/M.Tech(SE)

MSE-211– Advanced Steel Design (Credits - 3:0:0 = 3)

Teaching Scheme

Lectures: 3hrs/week

Course Objective :

- To impart sufficient knowledge to students on various codal provisions for steel structural design.
- To give hands on training in analysis and design of different types of bolted and welded connections, industrial structural members, cold formed structural elements, and special structures such as water tanks, chimney etc.
- To give exposure to students on plastic analysis of structures.

Syllabus Contents:

UNIT-1: Properties of Steel: Mechanical Properties, Hysteresis, Ductility.

Hot Rolled Sections: compactness and non-compactness, slenderness, residual stresses.

UNIT-2: Design of Steel Structures: Inelastic Bending Curvature, Plastic Moments, Design Criteria Stability, Strength, Drift.

UNIT-3: Stability of Beams: Local Buckling of Compression Flange & Web, Lateral Torsional Buckling. **Stability of Columns:** Slenderness Ratio, Local Buckling of Flanges and Web, Bracing of Column about Weak Axis.

UNIT-4: Method of Designs: Allowable Stress Design, Plastic Design, Load and Resistance Factor Design;

UNIT-5: Strength Criteria: Beams - Flexure, Shear, Torsion, Columns - Moment Magnification Factor, Effective Length, PM Interaction, Biaxial Bending, Joint Panel Zones. **Drift Criteria:** P Effect, Deformation Based Design; **Connections:** Welded, Bolted, Location Beam Column, Column Foundation, Splices.

Course Outcomes:

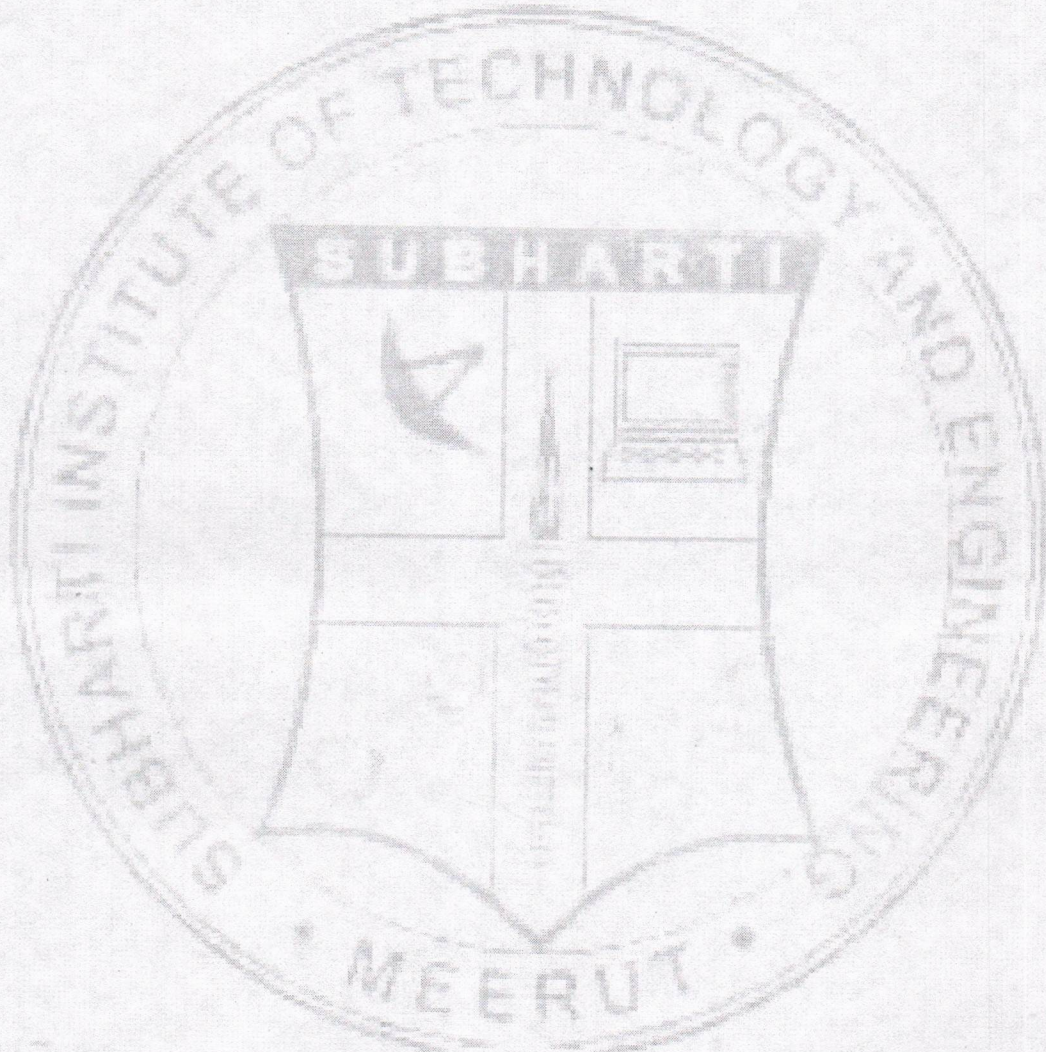
At the end of the course, students will be able to

- Design steel structures/ components by different design processes.
- Analyze and design beams and columns for stability and strength, and drift. Design welded and bolted connections

Reference Books:

- Design of Steel Structures - Vol. II, Ramchandra. Standard Book House, Delhi.
- Design of Steel Structures - Arya A. S., Ajmani J. L., Nemchand and Bros., Roorkee.
- The Steel Skeleton- Vol. II, Plastic Behaviour and Design - Baker J. F., Horne M. R., Heyman J., ELBS.

- Plastic Methods of Structural Analysis, Neal B. G., Chapman and Hall London.
- IS 800: 2007 – General Construction in Steel - Code of Practice, BIS, 2007.
- SP – 6 - Handbook of Structural Steel Detailing, BIS, 1987



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SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-II

Branch/Course: Civil Engineering/M.Tech(SE)

MSE-212– Design of Formwork(Credits - 3:0:0 = 3)

Teaching Scheme

Lectures: 3 hrs/week

Course Outcomes:

At the end of the course, students will be able to

- Select proper formwork, accessories and material.
- Design the form work for Beams, Slabs, columns, Walls and Foundations.
- Design the form work for Special Structures.
- Understand the working of flying formwork.
- Judge the formwork failures through case studies.

Syllabus Content:

UNIT-1: Introduction: Requirements and Selection of Formwork. **Formwork Materials-** Timber, Plywood, Steel, Aluminium, Plastic, and Accessories. Horizontal and Vertical Formwork Supports.

UNIT-2: Formwork Design: Concepts, Formwork Systems and Design for Foundations, Walls, Columns, Slab and Beams.

UNIT-3: Formwork Design for Special Structures: Shells, Domes, Folded Plates, Overhead Water Tanks, Natural Draft Cooling Tower, Bridges.

UNIT-4: Flying Formwork: Table Form, Tunnel Form, Slip Form, Formwork for Precast Concrete, Formwork Management Issues –Pre- and Post-Award.

UNIT-5: Formwork Failures: Causes and Case studies in Formwork Failure, Formwork Issues in Multi- Story Building Construction.

Reference Books:

- Formwork for Concrete Structures, Peurify, Mc Graw Hill India, 2015.
 - Formwork for Concrete Structures, Kumar NeerajJha, Tata McGraw Hill Education, 2012.
- IS 14687: 1999, False workfor Concrete Structures - Guidelines, BIS.**

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-II

Branch/Course: Civil Engineering/M.Tech(SE)

MSE-213 – Design of High Rise Structures (Credits - 3:0:0 = 3)

Teaching Scheme

Lectures: 3 hrs/week

Course Outcomes:

At the end of the course, students will be able to

- Analyses design and detail Transmission/ TV tower, Mast and Trestles with different loading conditions.
- Analyses design and detail the RC and Steel Chimney.
- Analyses. Design and detail the tall buildings subjected to different loading conditions using relevant codes.

Syllabus Content:

UNIT-1: Application of software in analysis and design

UNIT 2: Analysis and Design of RC and Steel Chimney, Foundation design for varied soil strata.

UNIT-3: Tall Buildings: Structural Concept, Configurations, various systems, Wind and Seismic loads, Dynamic approach, structural design considerations and IS code provisions. Firefighting design provisions.

UNIT-4: Design of transmission/ TV tower, Mast and trestles: Configuration, bracing system, analysis and design for vertical transverse and longitudinal loads.

Reference Books:

- Structural Design of Multi-storeyed Buildings, Varyani U. H., 2nd Ed., SouthAsian Publishers, New Delhi, 2002.
- Structural Analysis and Design of Tall Buildings, Taranath B. S., Mc Graw Hill, 1988.
- Illustrated Design of Reinforced Concrete Buildings(GF+3storeyed), Shah V. L. &Karve S. R., Structures Publications, Pune, 2013.
- Design of Multi Storeyed Buildings, Vol. 1 & 2, CPWD Publications, 1976.
- Tall Building Structures, Smith Byran S. and Coull Alex, Wiley India. 1991.
- High Rise Building Structures, Wolfgang Schueller, Wiley., 1971.
- Tall Chimneys, Manohar S. N., Tata Mc Graw Hill Publishing Company, New Delhi

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-II

Branch/Course: Civil Engineering/M.Tech(SE)

MSE-214 – Design of Advanced Concrete Structures (Credits - 3:0:0 = 3)

Teaching Scheme

Lectures: 3 hrs/week

Course Objective:

- To impart sufficient knowledge to students about properties of various concrete constituent materials, various methods of mix design, fresh and hardened properties of concrete.
- To expose the students to the application oriented special concretes, manufacturing methods and special concreting techniques.

Syllabus Contents:

Design philosophy, Modeling of Loads, Material Characteristics.

Reinforced Concrete - P-M, M-phi Relationships, Strut-and- Tie Method, Design of Deep Beam and Corbel, Design of Shear Walls, Compression Field Theory for Shear Design, Design against Torsion; IS, ACI and Eurocode.

Steel Structures -- Stability Design, Torsional Buckling - Pure, Flexural and Lateral, Design of Beam-Columns, Fatigue Resistant Design, IS code, AISC Standards and Euro code.

Course Outcomes:

At the end of the course, students will be able to

- Analyses the special structures by understanding their behavior.
- Design and prepare detail structural drawings for execution citing relevant IS codes.

References Books:

- Reinforced Concrete Design, Pillai S. U. and Menon D., Tata McGraw-Hill, 3rd Ed, 1999.
- Design of Steel Structures, Subramaniam N., Oxford University Press, 2008.
- Reinforced Concrete Structures, Park R. and Paulay T., John Wiley & Sons, 1995.
- Advanced Reinforced Concrete Design, Varghese P. C., Prentice Hall of India, New Delhi.
- Unified Theory of Concrete Structures, Hsu T. T. C. and Mo Y. L., John Wiley & Sons, 2010.
- Steel Structures Design and Behavior Emphasizing Load and Resistance Factor Design, Salmon C. G., Johnson J. E. and Malhas F. A., Pearson Education, 5th Ed, 2009.
- Design of Steel Structures - Vol. II, Ramchandra. Standard Book House, Delhi.
- Plastic Methods of Structural Analysis, Neal B.G., Chapman and Hall London.

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-II

Branch/Course: Civil Engineering/M.Tech (SE)

MSE-221 – Advanced Design of Foundations (Credits- 3:0:0 = 3)

Teaching Scheme

Lectures: 3 hrs/week

Course Objective:

- To impart knowledge about the suitability of soil strata for different projects.
- Student able to design shallow foundation and deciding the bearing capacity of soil.

Syllabus Contents:

UNIT-1: Shallow Foundations, Requirements for Satisfactory Performance of Foundations, Methods of Estimating Bearing Capacity, Settlements of Footings and Rafts, Proportioning of Foundations using Field Test Data, Pressure - Settlement Characteristics from Constitutive Laws.

UNIT-2: Pile Foundations, Methods of Estimating Load Transfer of Piles, Settlements of Pile Foundations, Pile Group Capacity and Settlement, Laterally Loaded Piles, Pile Load Tests, Analytical Estimation of Load- Settlement Behavior of Piles, Proportioning of Pile Foundations, Lateral and Uplift Capacity of Piles.

UNIT-3: Well Foundation, IS and IRC Code Provisions, Elastic Theory and Ultimate Resistance Methods.

UNIT-4: Tunnels and Arching in Soils, Pressure Computations around Tunnels. **Open Cuts**, Sheet piling and Bracing Systems in Shallow and Deep Open Cuts in Different Soil Types. **Coffer Dams**, Various Types, Analysis and Design, Foundations under uplifting loads, Soil-structure interaction.

UNIT-5: Planning of Soil Exploration for Different Projects, Methods of Subsurface Exploration, Methods of Borings along with Various Penetration Tests.

Course Outcomes:

At the end of the course, students will be able to

- Analyze and design the pile foundation.
- Understand analysis methods for well foundation.

Reference Books:

- Design of foundation system, N.P. Kurian, Narosa Publishing House
- Foundation Analysis and Design, J. E. Bowles, Tata McGraw Hill New York
- Analysis and Design of Substructures, Sawmi Saran, Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-II

Branch/Course: Civil Engineering/M.Tech (SE)

MSE-222 – Soil Structure Interaction (Credits- 3:0:0 = 3)

Teaching Scheme

Lectures: 3 hrs/week

Course Objective: Student able to :

- Prepare comprehensive design oriented computer programs for interaction problems based on theory of sub grade reaction such as beams, footings, rafts etc.
- Analyze different types of frame structure founded on stratified natural deposits with linear and non-linear stress-strain characteristics.

Syllabus Contents:

UNIT-1: Critical Study of Conventional Methods of Foundation Design, Nature and Complexities of Soil Structure Interaction.

UNIT-2: Application of Advanced Techniques of Analysis such as FEM and Finite Difference Method. Relaxation and Interaction for the Evaluation of Soil Structure Interaction for Different Types of Structure under various Conditions of Loading and Subsoil Characteristics.

UNIT-3: Preparation of Comprehensive Design Oriented Computer Programs for Specific Problems, Interaction Problems based on Theory of Sub Grade Reaction Such as Beams, Footings, Rafts Etc.

UNIT-4: Analysis of Different Types of Frame Structures Founded on Stratified Natural Deposits with Linear and Non-Linear Stress-Strain Characteristics.

UNIT-5: Determination of Pile Capacities and Negative Skin Friction, Action of Group of Piles Considering Stress-Strain Characteristics of Real Soils, Anchor Piles and Determination of Pullout Resistance.

Course Outcomes:

At the end of the course, students will be able to

- Understand soil structure interaction concept and complexities involved.
- Evaluate soil structure interaction for different types of structure under various conditions of loading and subsoil characteristics.
- Evaluate action of group of piles considering stress-strain characteristics of real soils.

Reference Books:

- Analytical and Computer Methods in Foundation, Bowels J.E., McGraw Hill Book Co., New York, 1974.
- Numerical Methods in Geotechnical Engineering, Desai C.S. and Christian J.T., McGraw Hill Book Co., New York.
- Soil Structure Interaction - The real behaviour of structures, Institution of Structural Engineers.
- Elastic Analysis of Soil Foundation Interaction, Developments in Geotechnical Engg. Vol-17, Elsevier Scientific Publishing Company.
- Elastic Analysis of Soil-Foundation Interaction, Selvadurai A.P.S., Elsevier Scientific Publishing Company.
- Analysis & Design of substructures, Swami Saran, Oxford & IBH Publishing Co. Pvt. Ltd.
- Design of Foundation System- Principles & Practices, Kurian N. P., Narosa Publishing

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT STUDY & EVALUATION SCHEME

YEAR 1st, SEMESTER-II

Branch/Course: Civil Engineering/M.Tech (SE)

MSE-251 – Testing Lab (Credits- 0:0:4 = 2)

Teaching Scheme

Lectures: 2 hrs/week,

Course Outcomes:

At the end of the course, students will be able to

- Understand the response of structures.
- Prepare the models.
- Conduct model testing for static loading
- Conduct model testing for free and forced vibrations

Syllabus Content:

- Response of structures and its elements against extreme loading events.
- Model Testing: Static - testing of plates, shells, and frames models.
- Model Testing: Free and forced vibrations, Evaluation of dynamic modulus.
- Beam vibrations, Vibration isolation, Shear wall building model, Time and frequency-domain study, Vibration Characteristics of RC Beams using Piezoelectric Sensors etc.

MSE-252 – Numerical Analysis Lab (Credits- 0:0:4 = 2)

Teaching Scheme

Lectures: 2 hrs/week

Course Outcomes:

At the end of the course, students will be able to

- Find Roots of non-linear equations by Bisection method and Newton's method.
- Do curve fitting by least square approximations
- Solve the system of Linear Equations using Gauss - Elimination/ Gauss - Seidal Iteration/ Gauss - Jordan Method

- To Integrate Numerically Using Trapezoidal and Simpson's Rules
- To Find Numerical Solution of Ordinary Differential Equations by Euler's Method, Runge- Kutta Method.

Syllabus Content:

- Find the Roots of Non-Linear Equation Using Bisection Method.
- Find the Roots of Non-Linear Equation Using Newton's Method.
- Curve Fitting by Least Square Approximations.
- Solve the System of Linear Equations Using Gauss - Elimination Method.
- Solve the System of Linear Equations Using Gauss - Seidal Iteration Method.
- Solve the System of Linear Equations Using Gauss - Jordan Method.
- Integrate numerically using Trapezoidal Rule.
- Integrate numerically using Simpson's Rules.
- Numerical Solution of Ordinary Differential Equations By Euler's Method.
- Numerical Solution of Ordinary Differential Equations By Runge- Kutta Method.

MSE-253- Mini Project (Credits- 0:0:4 = 2)

Teaching Scheme

Lectures: 4hrs/week

Course Outcomes:

At the end of the course, the student will be able to:

- Identify structural engineering problems reviewing available literature.
- Study different techniques used to analyze complex structural systems.
- Work on the solutions given and present solution by using his/her technique applying engineering principles.

Syllabus Contents:

- Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.
- End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solution: highlighting individuals' contribution.
- Continuous assessment of Mini Project at Mid Sem and End Sem will be monitored by the departmental committee.

**SUBHARTI INSTITUTE OF TECHNOLOGY & ENGINEERING
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME**

YEAR 2nd, SEMESTER-III

Branch/Course: Civil Engineering/M.Tech(SE)
w.e.f academic Session 2018-19

Sl. No.	Course Code	Course Name	Course Type	Period			CCA				ESE MARKS		TOTAL	Credits
				L	T	P	CT	AT	Total	PS	TE	PE		
1	MSE-(311-314)	Elective - V	PE-5	3	0	0	20	10	30	-	20	10	100	3
2	MSE-(001-006)	Open Elective -I	OPC-1	3	0	0	20	10	30	-	20	10	100	3
3	MSE-351	Dissertation Phase - I	PROJ-1	0	0	2	-	-	-	50	-	150	200	10
Total												400	16	

**SUBHARTI INSTITUTE OF TECHNOLOGY & ENGINEERING
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME**

YEAR 2nd, SEMESTER-IV

Branch/Course: Civil Engineering/M.Tech(SE)
w.e.f academic Session 2018-19

Sl. No.	Course Code	Course Name	Course Type	Period			CCA				ESE MARKS		TOTAL	Credits
				L	T	P	CT	AT	Total	PS	TE	PE		
1	MSE-451	Dissertation Phase - II	PROJ-2	0	0	32	-	-	-	100	-	200	300	16
Total												300	16	

M.TECH. (SE) GRAND TOTAL CREDITS - 68

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SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME

YEAR 2nd , SEMESTER-III

Branch/Course: Civil Engineering/M.Tech (SE)

METC 211 - English For Research Paper Writing (Credits- 2:0:0 = 0)

Teaching Scheme

Lectures: 3 hrs/week

Course objectives:

Students will be able to:

1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

Syllabus Contents:

Unit 1: Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check., key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

Unit 2: Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.

Unit 3: Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

Unit 4: skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions.

Course outcomes:

- Student will be able to write research paper effectively.
- Able to know how to write methodology, literature review in project work.

Reference Books:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME

YEAR 2nd, SEMESTER-III

Branch/Course: Civil Engineering/M.Tech (SE)

MSE-311 - Design of Prestressed Concrete Structures (Credits- 3:0:0 = 3)

Teaching Scheme

Lectures: 3 hrs/week

Course objective:

- Provide an understanding of the behaviour and performance of prestressed concrete structures.
- To impart knowledge to analyze and design prestressed concrete flexural members, design of commonly used prestressed concrete structures such as circular prestressing, composite construction members.

Syllabus Contents:

UNIT-1: Introduction to prestressed concrete: types of prestressing, systems and devices, materials, losses in prestress. Analysis of PSC flexural members: basic concepts, stresses at transfer and service loads, ultimate strength in flexure, code provisions.

UNIT-2: Transmission of prestress in pretensioned members; Anchorage zone stresses for post tensioned members. **Statically indeterminate structures** - Analysis and design - continuous beams and frames choice of cable profile, linear transformation and concordancy.

UNIT-3: Statically determinate PSC beams: design for ultimate and serviceability limit states for flexure, analysis and design for shear and torsion, code provisions.

UNIT-4: Composite construction with precast PSC beams and cast in-situ RC slab - Analysis and design, creep and shrinkage effects. Partial prestressing - principles, analysis and design concepts, crack- width calculations

UNIT-5: Analysis and design of prestressed concrete pipes, columns with moments.

Course outcomes:

At the end of the course, students will be able to

- Find out losses in the prestressed concrete. Understand the basic aspects of prestressed concrete fundamentals, including pre and post-tensioning processes.
- Analyse prestressed concrete deck slab and beam/ girders.
- Design prestressed concrete deck slab and beam/ girders.
- Design of end blocks for prestressed members.

References:

- Design of Prestressed Concrete Structures, Lin T.Y., Asia Publishing House, 1955.
- Prestressed Concrete, Krishnaraju N., Tata McGraw Hill, New Delhi, 1981.
- Limited State Design of Prestressed Concrete, Guyan Y., Applied Science Publishers, 1972.
- IS: 1343- Code of Practice for Prestressed Concrete
- IRC: 112

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME

YEAR 2nd, SEMESTER-III

Branch/Course: Civil Engineering/M.Tech (SE)

MSE-312–Analytical and Finite Element Analysis of Laminated Composite Plates (Credits-3:0:0 = 3)

Teaching Scheme

Lectures: 3 hrs/week

Course objectives:

- To introduce the fundamental concepts of finite element method, specifically the conception of an idea that involved in the finite element analysis of a structure
- To trained students in matrix techniques and plane stress and plane strain concepts.
- To familiarise the students with the application of finite element concepts to non- linear and vibration problems.

Syllabus Contents:

UNIT-1: Introduction: Displacement Field Approximations for Classical Laminated Plate Theory (CLPT) and First Order Shear Deformation Theory (FSDT), Analytical Solutions for Bending of Rectangular Laminated Plates using CLPT.

UNIT-2: Governing Equations. Navier Solutions of Cross-Ply and Angle-Ply Laminated Simply- Supported Plates Determination of Stresses. Levy Solutions for Plates with Other Boundary Conditions, Analytical Solution for Bending of Rectangular Laminated Plates Using FSDT.

UNIT-3: Finite Element Solutions for Bending of Rectangular Laminated Plates using CLPT.

UNIT-4: Introduction to Finite Element Method, Rectangular Elements, Formation of Stiffness Matrix, Formation of Load Vector, Numerical Integration, Post Computation of Stresses.

UNIT-5: Finite Element Solutions for Bending of Rectangular Laminated Plates using FSDT. Finite Element Model, C⁰ Element Formulation, Post Computation of Stresses. Analysis of Rectangular Composite Plates using Analytical Methods.

Course outcomes:

At the end of the course, students will be able to

- Analyse the rectangular composite plates using the analytical methods.
- Analyse the composite plates using advanced finite element method.
- Develop the computer programs for the analysis of composite plates.

References:

- Mechanics of Laminated Composites Plates and Shells, Reddy J. N., CRC Press.



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STUDY & EVALUATION SCHEME

YEAR 2nd , SEMESTER-III

Branch/Course: Civil Engineering/M.Tech (SE)

MSE-313 - Fracture Mechanics of Concrete Structures (Credits- 3:0:0 = 3)

Teaching Scheme

Lectures: 3 hrs/week

Course objectives: Student able to

- Identify and classify cracking of concrete structures based on fracture mechanics.
- Implement stress intensity factor for notched members

Syllabus Contents:

UNIT-1: Introduction: Basic Fracture Mechanics, Crack in a Structure, Mechanisms of Fracture and Crack Growth, Cleavage Fracture, Ductile Fracture, Fatigue Cracking, Environment assisted Cracking, Service Failure Analysis.

UNIT-2: Material Models: General Concepts, Crack Models, Band Models, Models based on Continuum Damage Mechanics, Applications to High Strength Concrete, Fibre Reinforced Concrete, Crack Concepts and Numerical Modeling.

UNIT-3: Stress at Crack Tip: Stress at Crack Tip, Linear Elastic Fracture Mechanics, Griffith's Criteria, Stress Intensity Factors, Crack Tip Plastic Zone, Erwin's Plastic Zone Correction, R curves, Compliance, J Integral Concept of CTOD and CMD.


Course outcomes:

At the end of the course, students will be able to

- Apply fracture mechanics models to high strength concrete and FRC structures.
- Compute J-integral for various sections understanding the concepts of LEFM.

Reference Books:

- Fracture Mechanics, Suri C. T. and Jin Z.H., 1st Edition, Elsevier Academic Press, 2012.
- Elementary Engineering Fracture Mechanics, Broek David, 3rd Rev. Ed. Springer, 1982.
- Fracture Mechanics of Concrete Structures – Theory and Applications, Elfgreen L., RILEM Report, Chapman and Hall, 1989.
- Fracture Mechanics – Applications to Concrete, Victor, Li C., Bazant Z. P., ACI SP 118, ACI Detroit, 1989.



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STUDY & EVALUATION SCHEME

YEAR 2nd, SEMESTER-III

Branch/Course: Civil Engineering/M.Tech (SE)

MSE-314 - Design of Plates and Shells(Credits- 3:0:0 = 3)

Teaching Scheme

Lectures: 3 hrs/week,

Course Outcomes:

At the end of the course, the student will be able to:

- Analyze and design prismatic folded plate systems.
- Analyse and design shells using approximate solutions
- Analyse and Design Cylindrical Shells
- Design Doubly Curved Shells using Approximate Solutions.

Syllabus Contents:

UNIT-1 Description of Prismatic folded Plate Systems

UNIT-2 Description of Shell Equations

UNIT-3 Description of Approximate Solutions

UNIT-4 Analysis and Design of Cylindrical Shells

UNIT-5 Approximate Design methods for Doubly Curved Shells.

Reference Books:

- Theory of Plates and Shells, Timoshenko and Woinowsky-Krieger S., Tata Mc Graw Hill Edition, 2010.
- Design and Construction of Concrete Shell Roofs, Ramaswamy G. S., 1st Edition, 2005.
- Design of Reinforced Concrete Shells & Folded Plate, Varghese P. C., 1st Edition, PHI.
- Design of Plate and Shell Structures, Jawad Maan H., Springer Science.

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME

YEAR 2nd , SEMESTER-III

Branch/Course: Civil Engineering/M.Tech (SE)

MSE-001 - Design of Plates and Shells(Credits- 3:0:0 = 3)

Teaching scheme

Lecture: - 3 h/week

Course objective:

- Understand the role of business analytics within an organization.
- Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
- To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
- To become familiar with processes needed to develop, report, and analyze business data.
- Use decision-making tools/Operations research techniques.

Syllabus Contents:

UNIT-1: Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies. Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization. Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend,

UNIT-2: Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making. Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

UNIT-3 Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process. Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools. Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

UNIT-4: Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carlo Simulation Using Analytical Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

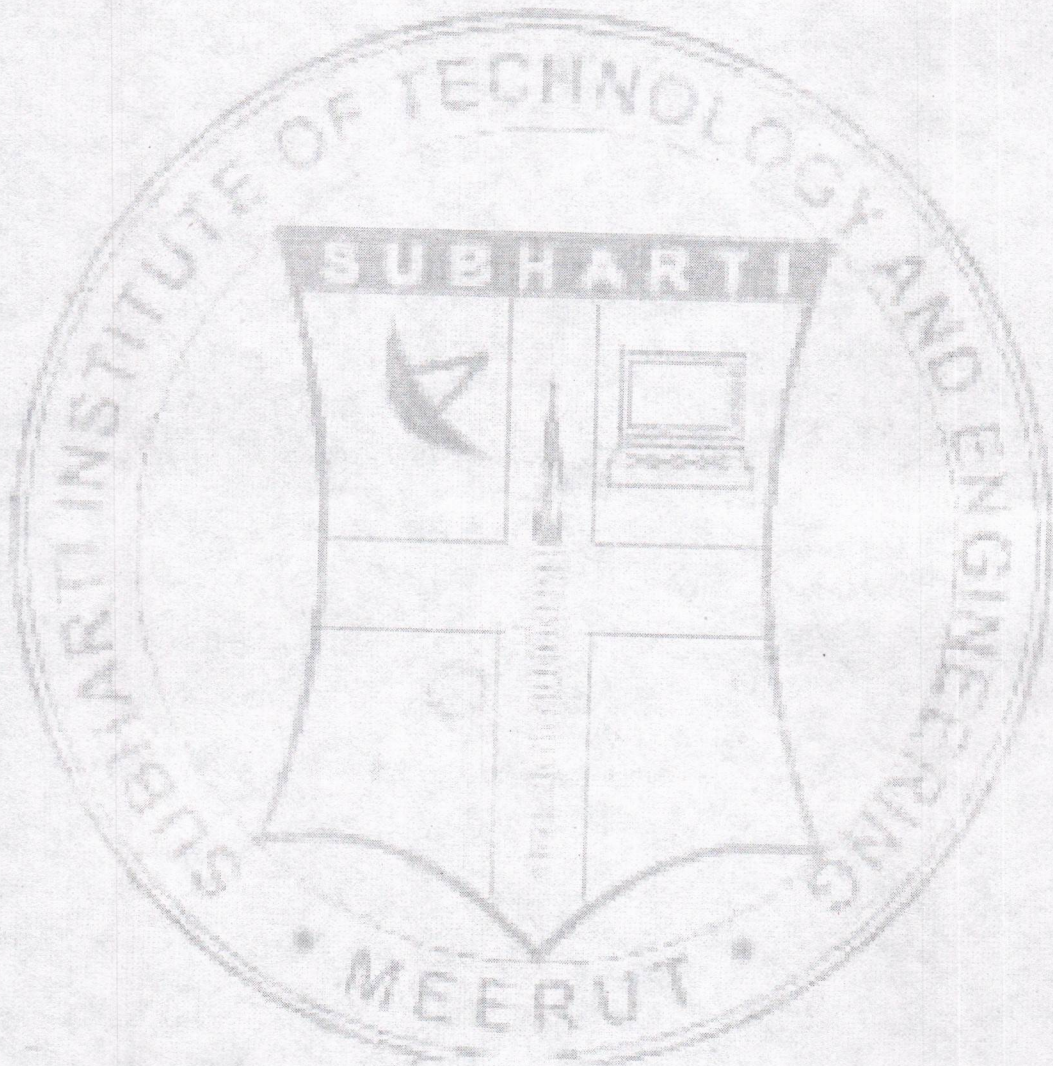
UNIT-5: Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

COURSE OUTCOMES :

- Students will demonstrate knowledge of data analytics.
- Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
- Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support busines decision-making..

Reference:

- Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
- Business Analytics by James Evans, persons Education.



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STUDY & EVALUATION SCHEME

YEAR 2nd, SEMESTER-III

Branch/Course: Civil Engineering/M.Tech (SE)

MSE-002 - Industrial Safety (Credits- 3:0:0 = 3)

Teaching scheme

Lecture: - 3 h/week

Course objective:

Student able to identify:

- How to prevent industries from fire
- How to do prevent pipes from corrosion
- How pumps work in which principle it work.

Syllabus Contents:

Unit-1: Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and application of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit-2: Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

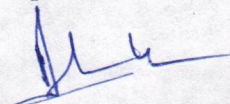
Unit-3: Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

Unit-4: Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit-5: Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Reference:

- Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
- Maintenance Engineering, H. P. Garg, S. Chand and Company.
- Pump-hydraulic Compressors, Audels, Mcgraw Hill Publication.
- Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.



SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME

YEAR 2nd , SEMESTER-III

Branch/Course: Civil Engineering/M.Tech (SE)

MSE-003 – Operation research (Credits- 3:0:0 = 3)

Teaching Scheme

Lectures: 3 hrs/week

Course objective:

- Students should able to carry out sensitivity analysis
- Student should able to model the real world problem and simulate it.

Syllabus Contents:

Unit 1: Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models.

Unit 2: Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

Unit 3: Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

Unit 4: Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

Unit 5: Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

Course Outcomes:

At the end of the course, the student should be able to

- Students should able to apply the dynamic programming to solve problems of discrete and continuous variable.
- Students should able to apply the concept of non-linear programming

References:

- H.A. Taha, Operations Research, An Introduction, PHI, 2008
- H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
- J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
- Hitler Libermann Operations Research: McGraw Hill Pub. 2009
- Pannerselvam, Operations Research: Prentice Hall of India 2010
- Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

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STUDY & EVALUATION SCHEME

YEAR 2nd, SEMESTER-III

Branch/Course: Civil Engineering/M.Tech (SE)

MSE-004 - Cost Management of Engineering Projects (Credits- 3:0:0 = 3)

Teaching scheme

Lecture: - 3 h/week

Course objective:

- Student able to analyze cost planning
- Student able to develop PERT and CPM
- To impart knowledge about break even analysis

Syllabus Contents:

Unit1 : Introduction and Overview of the Strategic Cost Management Process .Cost concepts in decision-making. Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

Unit 2: Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Cost and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning

Unit 3: Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non- technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning mechanical and process.

Unit 4: Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

Unit 5: Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

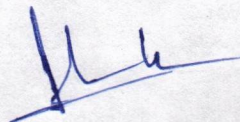
Course Outcomes:

- Understand the roles of managers in firms.
- Analyze the demand and supply conditions and assess the position of a company.
- Design competition strategies, including costing, pricing, product differentiation, and market environment according to the natures of products and the structures of the markets.



References:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd



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STUDY & EVALUATION SCHEME

YEAR 2nd, SEMESTER-III

Branch/Course: Civil Engineering/M.Tech (SE)

MSE-005 - Composite Materials (Credits- 3:0:0 = 3)

Teaching scheme

Lecture: - 3 h/week

Course Objective :

- To impart sufficient knowledge about classification and characteristics of composite materials used in structures.
- To develop an understanding on analysis of laminated composites, netting analysis, manufacturing and fabrication processes of fibres.

Syllabus Contents:

UNIT-1: INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – 2: Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria interacting failure criteria, hygrothermal failure. Laminate first ply failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

UNIT – 3: REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT-4: Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs - hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT – 5: Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding Weaving. Properties and applications

Couse Outcome : On successful completion of these modules, students will

- Be able to classify the composite materials and their use in structures.
- have the knowledge to analyse, manufacture and fabricate the composite materials.

TEXT BOOKS:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME

YEAR 2nd, SEMESTER-III

Branch/Course: Civil Engineering/M.Tech (SE)

Open Elective - Waste to Energy (Credits- 3:0:0 = 3)

Teaching scheme

Lecture: - 3 h/week

Course Objectives:

To enable students to understand of the concept of Waste to Energy.

To link legal, technical and management principles for production of energy form waste.

To learn about the best available technologies for waste to energy.

Syllabus Contents:

Unit-1: Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

Unit-2: Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

Unit-3: Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Unit-4: Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation . Operation of all the above biomass combustors.

Unit-5: Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

Couse Outcome :

- Apply the knowledge about the operations of Waste to Energy Plants.
- Analyse the various aspects of Waste to Energy Management Systems.
- Carry out Techno-economic feasibility for Waste to Energy Plants.
- Apply the knowledge in planning and operations of Waste to Energy plants.

References:

- Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
- Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
- Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
- Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

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STUDY & EVALUATION SCHEME

YEAR 2nd , SEMESTER-III

Branch/Course: Civil Engineering/M.Tech (SE)

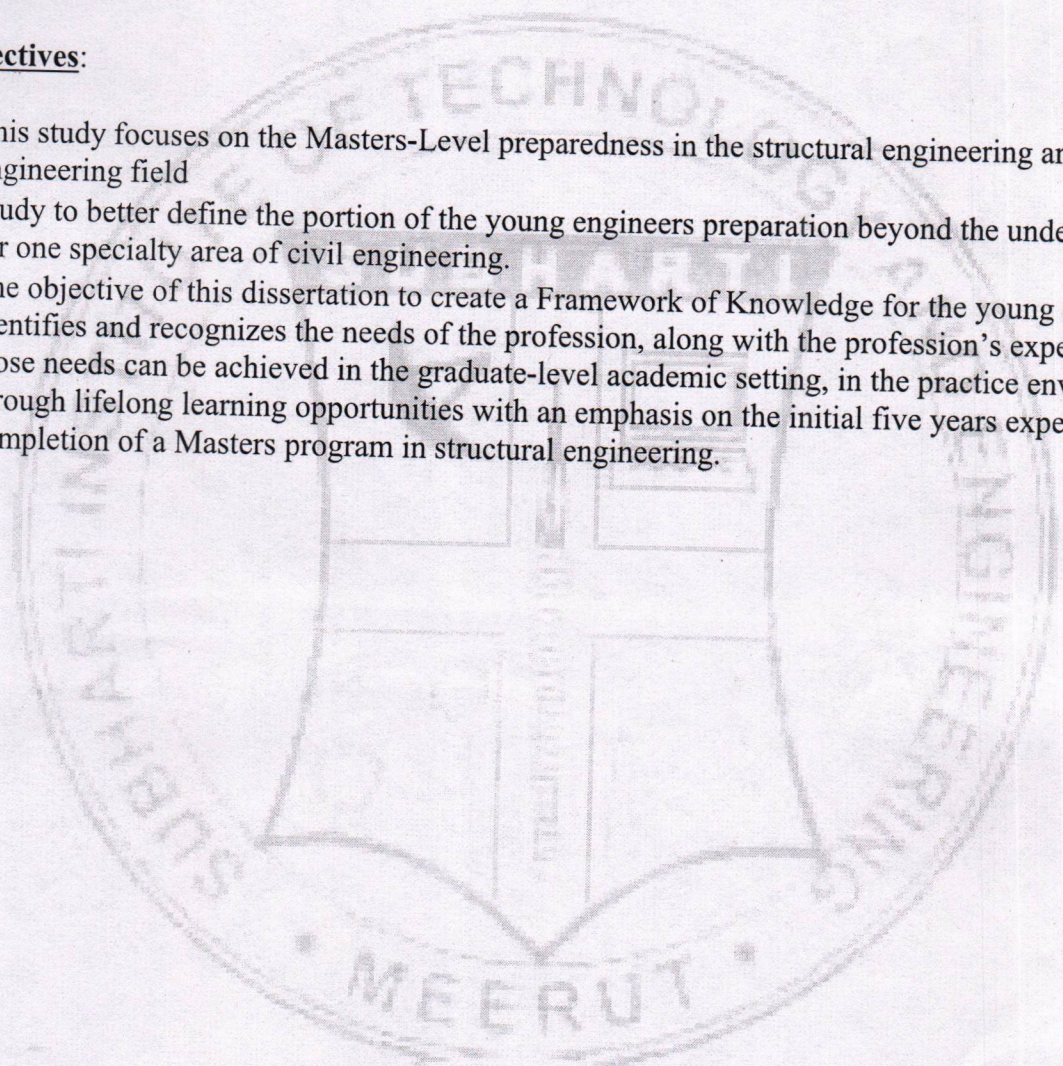
MSE-351 - Dissertation Phase -1 (Credits- 0:0:2 = 10)

Teaching scheme

Lecture: - 2 h/week

Course Objectives:

- This study focuses on the Masters-Level preparedness in the structural engineering area within the civil engineering field
- Study to better define the portion of the young engineers preparation beyond the undergraduate program for one specialty area of civil engineering.
- The objective of this dissertation to create a Framework of Knowledge for the young engineer which identifies and recognizes the needs of the profession, along with the profession's expectations of how those needs can be achieved in the graduate-level academic setting, in the practice environment, and through lifelong learning opportunities with an emphasis on the initial five years experience past completion of a Masters program in structural engineering.



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