UTTARAKHAND TECHNICAL UNIVERSITY, DEHRADUN

M.TECH (STRUCTURAL ENGINEERING PROGRAMME)
# M. Tech. (Civil Engineering) Specialization: Structural Engineering

## Semester I

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<tr>
<th>Sr. No.</th>
<th>Course Type/Code</th>
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<tbody>
<tr>
<td>1.</td>
<td>MSET-101</td>
<td>Advanced Structural Analysis</td>
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<tr>
<td>2.</td>
<td>MSET-102</td>
<td>Advanced Solid Mechanics</td>
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<tr>
<td>3.</td>
<td>MSET-103</td>
<td>Analytical and Numerical Methods for Structural Engineering</td>
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</tbody>
</table>
| 4.      | Program Elective | Elective – I  
  1. MSET-111 Theory of Thin Plates and Shells  
  2. MSET-112 Theory and application of cement composites  
  3. MSET-113 Theory of Structural Stability  
  4. MSET-114 Structural Health monitoring |
| 5.      | MSEP101          | Structural Design Lab |
| 6.      | MSEP102          | Advanced Concrete Lab |
| 7.      | MLC              | Research Methodology and IPR |
| 8.      | Audit 1          | Audit Course |

## Semester II

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<tr>
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<td>MSET-201</td>
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<tr>
<td>2.</td>
<td>MSET-202</td>
<td>Structural Dynamics</td>
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</table>
| 3.      | Program Elective | Elective – II  
  1. MSET-211 Advanced Steel Design  
  2. MSET-212 Design of Formwork  
  3. MSET-213 Design of High Rise Structures  
  4. MSET-214 Design of Masonry Structures |
| 4.      | Program Elective | Elective – II  
  1. MSET-221 Design of Advanced Concrete Structures  
  2. MSET-222 Advanced Design of Foundations  
  3. MSET-223 Soil Structure Interaction  
  4. MSET-224 Design of Industrial Structure |
| 5.      | MSEP-201         | Model Testing Lab |
| 6.      | MSEP-202         | Numerical Analysis Lab |
| 7.      | MSEP-203         | Mini Project |
| 8.      | Audit 2          | Audit Course-2 |
### Semester III

<table>
<thead>
<tr>
<th>Sr. No.</th>
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| 1. | Program Elective – I | Elective – I  
1. MSET-311 Design of Prestressed Concrete Structures  
2. MSET-312 Analysis of Laminated Composite Plates  
3. MSET-313 Fracture Mechanics of Concrete Structures  
4. MSET-314 Design of Plates and Shells |
| 2. | Open Elective | 1. MOET -391 Business Analytics  
2. MOET -392 Industrial Safety  
3. MOET -393 Operations Research  
4. MOET -394 Cost Management of Engineering Projects  
5. MOET -395 Composite Materials  
6. MOET -396 Waste to Energy |
| 3. | Dissertation/ MSEP-301 | Dissertation Phase – I |

### Semester IV

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Audit course 1 & 2

- English for Research Paper Writing
- Disaster Management
- Sanskrit for Technical Knowledge
- Value Addition
- Constitution of India
- Pedagogy Studies
- Stress Management by Yoga
- Personality Development through Life Enlightenment Skills.
M. Tech (Civil Engineering)
Model Curriculum Structure
Specialization: Structural Engineering

Program Outcomes (POs):
After completion of the program graduates will be able to

A. 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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<tr>
<th>Sr. No.</th>
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<th>Credits</th>
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<td>4. MSET-114 Structural Health Monitoring</td>
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### Semester-IV

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<td>Dissertation Phase – II</td>
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Total Credits for the programme = 18 + 18 +16 +16 = 68

**Audit course 1 & 2**

- English for Research Paper Writing
- Disaster Management
- Sanskrit for Technical Knowledge
- Value Addition
- Constitution of India
- Pedagogy Studies
- Stress Management by Yoga
- Personality Development through Life Enlightenment Skills.
Semester I

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

Subject code: MSET-101

Teaching Scheme
Lectures: 3 hrs/week

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

Syllabus Contents:

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

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.

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

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

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

References:

   Matrix Analysis of Framed Structures, Weaver and Gere.
   Computer Methods in Structural Analysis, Meek J. L., E and FN, Span Publication.
   The Finite Element Method, Desai and Able, CBS Publication.
Advanced Solid Mechanics (Credits - 3:0:0 = 3)

Subject Code: MSET-102

Teaching Scheme
Lectures: 3 hrs/week

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.

Syllabus Contents:

**Introduction to Elasticity:** Displacement, Strain and Stress Fields, Constitutive Relations, Cartesian Tensors and Equations of Elasticity.

**Strain and Stress Field:** Elementary Concept of Strain, Stain at a Point, Principal Strains and Principal Axes, Compatibility Conditions, Stress at a Point, Stress Components on an Arbitrary Plane, Differential Equations of Equilibrium, Hydrostatic and Deviatoric Components.

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


**Torsion of Prismatic Bars:** Saint Venant’s Method, Prandtl’s Membrane Analogy, Torsion of Rectangular Bar, Torsion of Thin Tubes.

**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.

References:

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

Subject Code: MSET-111

Teaching Scheme
Lectures: 3 hrs/week

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.

Syllabus Contents:


**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.

**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.

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

**Shells of Revolution:** with Bending Resistance - Cylindrical and Conical Shells, Application to Pipes and Pressure Vessels.

**Thermal Stresses in Plate/Shell**

References:

- Stresses in Plates and Shells, Ugural Ansel C., McGraw Hill.
- Thin Elastic Shells, Kraus H., John Wiley and Sons.
- Theory of Plates, Chandrashekhar K., Universities Press.
- Design and Construction of Concrete Shells, Ramaswamy G.S.
Theory and Applications of Cement Composites

(Credits- 3:0:0=3)

Subject Code: MSET-112

Teaching Scheme

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

- Formulate constitutive behaviour of composite materials – Ferrocement, SIFCON and Fibre Reinforced Concrete - by understanding their strain-stress behaviour.
- Classify the materials as per orthotropic and anisotropic behaviour.
- Estimate strain constants using theories applicable to composite materials.
- Analyse and design structural elements made of cement composites.

Syllabus Content:

- **Mechanical Behaviour**: 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.
- **Cement Composites**: Types of Cement Composites, Terminology, Constituent Materials and their Properties, Construction Techniques for Fibre Reinforced Concrete - Ferrocement, SIFCON, Polymer Concretes, Preparation of Reinforcement, Casting and Curing.
- **Mechanical Properties of Cement Composites**: Behavior of Ferrocement, Fiber Reinforced Concrete in Tension, Compression, Flexure, Shear, Fatigue and Impact, Durability and Corrosion.
- **Analysis and Design of Cement Composite Structural Elements** - Ferrocement, SIFCON and Fibre Reinforced Concrete.

Reference Books:

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

Subject Code:MSET-113

Teaching Scheme
Lectures: 3 hrs/week

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 analysing discrete and continuous systems,

Syllabus Contents:


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

Stability of Beams: Lateral torsion buckling.

Stability of Plates: Axial flexural buckling, shear flexural buckling, buckling under combined loads.

Introduction to Inelastic Buckling and Dynamic Stability.

Reference Books:
Analytical and Numerical Methods for Structural Engineering
(Credits - 3:0:0 = 3)

Subject Code: MSET-103

Teaching Scheme
Lectures: 3 hrs/week

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.

Syllabus Contents:
Fundamentals of Numerical Methods: Error Analysis, Polynomial Approximations and Interpolations, Curve Fitting; Interpolation and extrapolation.
Solution of Nonlinear Algebraic and Transcendental Equations
Elements of Matrix Algebra: Solution of Systems of Linear Equations, Eigen Value Problems.
Finite Difference scheme: Implicit & Explicit scheme.

Reference Books:
Structural Health Monitoring (Credits - 3:0:0 = 3)

Subject Code: MSET-114

Teaching Scheme
Lectures: 3 hrs/week

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. Assess the health of structure using dynamic field tests. Suggest repairs and rehabilitation measures of the structure

Syllabus Contents:

Structural Health: Factors affecting Health of Structures, Causes of Distress, Regular Maintenance.


Structural Audit: Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

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


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.

Reference Books:

Structural Health Monitoring, Daniel Balageas, Claus Peter Fritzen, Alfredo Güemes, John Wiley and Sons, 2006.


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

Subject Code :MSEP-101

Teaching Scheme
Lab: 2 hrs/week

Course Outcomes: At the end of the course, students will be able to
Design and Detail all the Structural Components of Frame Buildings.
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.

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

Subject Code: MSEP-102

Teaching Scheme
Lab: 2 hrs/week

Course Outcomes: At the end of the course, students will be able to
Design high grade concrete and study the parameters affecting its performance.
Conduct Non Destructive Tests on existing concrete structures.
Apply engineering principles to understand behavior of structural/ elements.

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

Reference Books:
Concrete Technology, Shetty M. S., S. Chand and Co., 2006.
Teaching Scheme
Lectures: 1hrs/week

Course Outcomes:
At the end of this course, students will be able to
  Understand research problem formulation.
  Analyze research related information
  Follow research ethics
  Understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
  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.
  Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

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 literature studies approaches, analysis
  Plagiarism, Research ethics,
Unit 3: Effective technical writing, how to write report, Paper
  Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

References:
  Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students”
  Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
Semester II

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

Subject Code: MSET-201

Teaching Scheme
Lectures: 3 hrs/week

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.

Syllabus Contents:
- 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.

Reference Books:
Structural Dynamics (Credits - 3:0:0 = 3)

Subject Code: MSET-202

Teaching Scheme
Lectures: 3 hrs/week

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.


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.


Reference Books:
- Structural Dynamics and Introduction to Earthquake Engineering, Chopra A. K.
- Dynamics of Structures, Humar J. L., Prentice Hall.
Advanced Steel Design (Credits - 3:0:0 = 3)

Subject Code: MSET-211

Teaching Scheme
Lectures: 3 hrs/week

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.

Syllabus Contents:
Properties of Steel: Mechanical Properties, Hysteresis, Ductility.
Hot Rolled Sections: compactness and non-compactness, slenderness, residual stresses.
Design of Steel Structures: Inelastic Bending Curvature, Plastic Moments, Design Criteria
Stability, Strength, Drift.
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.
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.

Reference Books:
Design of Steel Structures - Arya A. S., Ajmani J. L., Nemchand and Bros., Roorkee.
SP – 6 - Handbook of Structural Steel Detailing, BIS, 1987
Design of Formwork (Credits - 3:0:0 = 3)

Subject Code:MSET-212

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:
Introduction: Requirements and Selection of Formwork.
- Formwork Design for Special Structures: Shells, Domes, Folded Plates, Overhead Water Tanks, Natural Draft Cooling Tower, Bridges.

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

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

Reference Books:
Design of High Rise Structures (Credits - 3:0:0 = 3)

Subject Code:MSET-213

Teaching Scheme
Lectures: 3 hrs/week

Course Outcomes: At the end of the course, students will be able to
- Analyse, design and detail Transmission/ TV tower, Mast and Trestles with different loading conditions.
- Analyse, design and detail the RC and Steel Chimney.
- Analyse, design and detail the tall buildings subjected to different loading conditions using relevant codes.

Syllabus Content:
- Design of transmission/ TV tower, Mast and trestles: Configuration, bracing system, analysis and design for vertical transverse and longitudinal loads.
- Analysis and Design of RC and Steel Chimney, Foundation design for varied soil strata.
- Tall Buildings: Structural Concept, Configurations, various systems, Wind and Seismic loads, Dynamic approach, structural design considerations and IS code provisions. Firefighting design provisions.
- Application of software in analysis and design.

Reference Books:
- Tall Building Structures, Smith Byran S. and Coull Alex, Wiley India. 1991.
Design of Masonry Structures (Credits- 3:0:0 = 3)

Subject Code: MSET-214

Teaching Scheme
Lectures: 3 hrs/week

Course outcomes: At the end of the course, students will be able to
Understand the masonry design approaches.
Analyse Reinforced Masonry Members.
Determine interactions between members.
Determine shear strength and ductility of Reinforced Masonry members.
Check the stability of walls
Perform elastic and Inelastic analysis of masonry walls.

Syllabus Contents:
Introduction: Historical Perspective, Masonry Materials, Masonry Design Approaches, Overview of Load Conditions, Compression Behaviour of Masonry, Masonry Wall Configurations, Distribution of Lateral Forces.
Flexural Strength of Reinforced Masonry Members: In plane and Out-of-plane Loading.
Interactions: Structural Wall, Columns and Pilasters, Retaining Wall, Pier and Foundation. Shear Strength and Ductility of Reinforced Masonry Members.
Prestressed Masonry - Stability of Walls, Coupling of Masonry Walls, Openings, Columns, Beams.

Reference Books:
Design of Reinforced Masonry Structures, Narendra Taly, ICC, 2nd Edn.
Design of Advanced Concrete Structures (Credits - 3:0:0 = 3)

Subject Code: MSET-221

Teaching Scheme
Lectures: 3 hrs/week

Course Outcomes: At the end of the course, students will be able to
  Analyse the special structures by understanding their behaviour.
  Design and prepare detail structural drawings for execution citing relevant IS codes.

Syllabus Contents:

Design philosophy, Modeling of Loads, Material Characteristics.


References Books:

  Design of Steel Structures, SubramaniamN., Oxford University Press, 2008.
Advanced Design of Foundations (Credits- 3:0:0 = 3)

Subject Code: MSET-222

Teaching Scheme
Lectures: 3 hrs/week

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

- Decide the suitability of soil strata for different projects.
- Design shallow foundations deciding the bearing capacity of soil.
- Analyze and design the pile foundation.
- Understand analysis methods for well foundation.

Syllabus Contents:

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


Tunnels and Arching in Soils, Pressure Computations around Tunnels. Open Cuts, Sheeting 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

Reference Books:
Design of foundation system, N.P. Kurian, Narosa Publishing House
Soil Structure Interaction (Credits- 3:0:0 = 3)

Subject Code: MSET-223

Teaching Scheme
Lectures: 3 hrs/week

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.
  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.
  Evaluate action of group of piles considering stress-strain characteristics of real soils.

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

Reference Books:
Design of Industrial Structures (Credits- 3:0:0 = 3)

Subject Code:MSET-224

Teaching Scheme
Lectures: 3 hrs/week

Course Outcomes: At the end of the course, the student will be able to:
- Design Steel Gantry Girders.
- Design Steel Portal, Gable Frames.
- Design Steel Bunkers and Silos.
- Design Chimneys and Water Tanks.

Syllabus Contents:
- **Steel Gantry Girders** – Introduction, loads acting on gantry girder, permissible stress, types of gantry girders and crane rails, crane data, maximum moments and shears, construction detail, design procedure.
- **Portal Frames** – Design of portal frame with hinge base, design of portal frame with fixed base – Gable Structures – Lightweight Structures
- **Chimneys** – Introduction, dimensions of steel stacks, chimney lining, breech openings and access ladder, loading and load combinations, design considerations, stability consideration, design of base plate, design of foundation bolts, design of foundation.

Reference Books:
- Design of Steel Structures, Subramaniyam.

Testing Lab (Credits- 0:0:4 = 2)

Subject Code:MSEP-201
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.
- Beam vibrations, Vibration isolation, Shear wall building model, Time and frequency-domain study, Vibration Characteristics of RC Beams using Piezoelectric Sensors etc.
Numerical Analysis Lab (Credits: 0:0:4 = 2)

Subject Code: MSEP-202

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 - Jorden 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 Contents:
- 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 - Jorden Method.
- Integrate numerically using Trapezoidal Rule.
- Integrate numerically using Simpson’s Rules.
- Numerical Solution of Ordinary Differential Equations By Euler’s Method.
Mini Project (Credits- 0:0:4 = 2)

Subject Code: MSEP-203

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 solutions highlighting individuals’ contribution.

Continuous assessment of Mini Project at Mid Sem and End Sem will be monitored by the departmental committee.
Design of Prestressed Concrete Structures

Subject Code: MSET-311

Teaching Scheme
Lectures: 3 hrs/week

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.

Syllabus Contents:
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.
Statically determinate PSC beams: design for ultimate and serviceability limit states for flexure, analysis and design for shear and torsion, code provisions.
Transmission of prestress in pretensioned members; Anchorage zone stresses for posttensioned members.
Statically indeterminate structures - Analysis and design - continuous beams and frames, choice of cable profile, linear transformation and concordancy.
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.

Analysis and design of prestressed concrete pipes, columns with moments.

References:
- Prestressed Concrete, Krishnaraju N., Tata McGraw Hill, New Delhi, 1981.
- IS: 1343- Code of Practice for Prestressed Concrete
- IRC: 112
Analytical and Finite Element Analysis of
Laminated Composite Plates (Credits- 3:0:0 = 3)

Subject Code: MSET-312

Teaching Scheme
Lectures: 3 hrs/week

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.

Syllabus Contents:
   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.
   Finite Element Solutions for Bending of Rectangular Laminated Plates using CLPT.
   Finite Element Solutions for Bending of Rectangular Laminated Plates using FSDT.
   Finite Element Model, $C^0$ Element Formulation, Post Computation of Stresses.
   Analysis of Rectangular Composite Plates using Analytical Methods.

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

Subject Code:MSET-313

Teaching Scheme
Lectures: 3 hrs/week

Course outcomes: At the end of the course, students will be able to
   Identify and classify cracking of concrete structures based on fracture mechanics.
   Implement stress intensity factor for notched members
   apply fracture mechanics models to high strength concrete and FRC structures.
   Compute J-integral for various sections understanding the concepts of LEFM.

Syllabus Contents:
   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.
   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.
   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.

Reference Books:
Design of Plates and Shells (Credits- 3:0:0 = 3)

Subject Code: MSET-314

Teaching Scheme
Lectures: 3 hrs/week, –

Course Outcomes: At the end of the course, the student will be able to:
- Analyse 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:
- Prismatic folded Plate Systems
- Shell Equations
- Approximate Solutions
- Analysis and Design of Cylindrical Shells
- Approximate Design methods for Doubly Curved Shells.

Reference Books:
- Design of Reinforced Concrete Shells & Folded Plate, Varghese P. C., 1st Edition, PHI.
- Design of Plate and Shell Structures, Jawad Maan H., Springer Science.
Dissertation I (Credits- 0:0:20 = 10)

Subject Code:MSEP-301

Teaching Scheme
Lectures: 3hrs/week Mid Sem Evaluation weightage - 30%

End Sem Evaluation weightage - 70%

Course Outcomes: At the end of the course, the student will be able to:
  Identify structural engineering problems reviewing available literature.
  Identify appropriate techniques to analyze complex structural systems.
  Apply engineering and management principles through efficient handling of project

Syllabus Contents:
Dissertation-I 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 solutions and must bring out individuals contribution.

Continuous assessment of Dissertation – I and Dissertation – II at Mid Sem and End Sem will be monitored by the departmental committee.
Dissertation II (Credits- 0:0:32 = 16)

Subject Code: MSEP-401

Teaching Scheme
Contact Hours: 3hrs/week

Course Outcomes: At the end of the course, the student will be able to:
- Solve complex structural problems by applying appropriate techniques and tools.
- Exhibit good communication skill to the engineering community and society.
- Demonstrate professional ethics and work culture.

Syllabus Contents:
Dissertation – II will be extension of the to work on the topic identified in Dissertation – I.

Continuous assessment should be done of the work done by adopting the methodology decided involving numerical analysis/ conduct experiments, collection and analysis of data, etc. There will be presubmission seminar at the end of academic term. After the approval the student has to submit the detail report and external examiner is called for the viva-voce to assess along with guide.
OPEN ELECTIVES

Subject: Business Analytics

Subject Code: MOET-391

Teaching scheme
  Lecture: - 3 h/week

<table>
<thead>
<tr>
<th>Course Code</th>
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<tr>
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<tr>
<td>Course Name</td>
<td>Business Analytics</td>
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<td>Credits</td>
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<td>Prerequisites</td>
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Total Number of Lectures: 48
<table>
<thead>
<tr>
<th>Course objective</th>
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<tbody>
<tr>
<td>Understand the role of business analytics within an organization.</td>
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<tr>
<td>Analyze data using statistical and data mining techniques and understand</td>
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<td>relationships between the underlying business processes of an organization.</td>
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<td>To gain an understanding of how managers use business analytics to formulate</td>
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<td>and solve business problems and to support managerial decision making.</td>
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<td>To become familiar with processes needed to develop, report, and analyze</td>
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<tr>
<td>business data.</td>
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<td>Use decision-making tools/Operations research techniques.</td>
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<td>Manage business process using analytical and management tools.</td>
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<td>Analyze and solve problems from different industries such as manufacturing,</td>
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<td>service, retail, software, banking and finance, sports, pharmaceutical,</td>
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<td>aerospace etc.</td>
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<tr>
<th>LECTURE WITH BREAKUP</th>
<th>NO. OF LECTURES</th>
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<tbody>
<tr>
<td>Unit 1:</td>
<td>9</td>
</tr>
<tr>
<td>Business analytics: Overview of Business analytics, Scope of Business analytics,</td>
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<tr>
<td>Business Analytics Process, Relationship of Business Analytics Process and</td>
<td></td>
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<td>organisation, competitive advantages of Business Analytics.</td>
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<tr>
<td>Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of</td>
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<tr>
<td>probability distribution and data modelling, sampling and estimation methods overview.</td>
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<tr>
<td>Unit 2:</td>
<td>8</td>
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<tr>
<td>Trendiness and Regression Analysis: Modelling Relationships and Trends in Data,</td>
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<tr>
<td>simple Linear Regression.</td>
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<tr>
<td>Important Resources, Business Analytics Personnel, Data and models for Business</td>
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<tr>
<td>analytics, problem solving, Visualizing and Exploring Data, Business Analytics</td>
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<td>Technology.</td>
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<td>Unit 3:</td>
<td>9</td>
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<tr>
<td>Organization Structures of Business analytics, Team management, Management Issues,</td>
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<tr>
<td>Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring</td>
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<td>contribution of Business analytics, Managing Changes.</td>
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<tr>
<td>Descriptive Analytics, predictive analytics, predicative Modelling, Predictive</td>
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<td>analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics</td>
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<td>and its step in the business analytics Process, Prescriptive Modelling, nonlinear</td>
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<tr>
<td>Optimization.</td>
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<td>Unit 4:</td>
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<tr>
<td>Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical</td>
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<tr>
<td>Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting</td>
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<tr>
<td>Models for Time Series with a Linear Trend, Forecasting Time Series with</td>
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<tr>
<td>Seasonality, Regression</td>
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</table>
Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.

Unit 5:

Unit 6:
Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

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 business decision-making. |
| Students will demonstrate the ability to translate data into clear, actionable insights. |

Reference:
Business Analytics by James Evans, persons Education.
OPEN ELECTIVES

Subject: Industrial Safety

Subject Code: MOET-392
Teaching scheme
Lecture: - 3 h/week

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

**Unit-IV: 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-V: 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

**Reference:**
Maintenance Engineering, H. P. Garg, S. Chand and Company.
Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.

**OPEN ELECTIVES**

**Subject:** Operations Research

**Subject Code:** MOET - 393

**Teaching Scheme**
Lectures: 3 hrs/week

**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 discreet and continuous variables.
- Students should able to apply the concept of non-linear programming
- 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

References:
J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
Pannerselvam, Operations Research: Prentice Hall of India 2010

Open Elective

Subject: Cost Management of Engineering Projects

Subject Code: MOET - 394

Teaching scheme
Lecture: - 3 h/week

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.
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


References:
Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
Charles T. Horngren and George Foster, Advanced Management Accounting Robert S
Kaplan Anthony A. Alkinson, Management & Cost Accounting
Subject: Composite Materials

Subject Code: MOET -395

Teaching scheme
Lecture: - 3 h/week


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

TEXT BOOKS:

References:
Subject: Waste to Energy

Subject Code: MOET -396

Teaching scheme
Lecture: - 3 h/week
Unit-I: Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors


Unit-IV: 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-V: 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.

References:


AUDIT 1 and 2: ENGLISH FOR RESEARCH PAPER WRITING

Course objectives:

Students will be able to:

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

<table>
<thead>
<tr>
<th>Course objectives</th>
<th>Syllabus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness</td>
<td>Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, 4 Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction</td>
</tr>
<tr>
<td>Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.</td>
<td>4</td>
</tr>
<tr>
<td>4 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,</td>
<td>4</td>
</tr>
<tr>
<td>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</td>
<td>4</td>
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<tr>
<td>useful phrases, how to ensure paper is as good as it could possibly be the first-time submission</td>
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</tbody>
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<thead>
<tr>
<th>Units</th>
<th>CONTENTS</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness</td>
<td>4</td>
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<tr>
<td>4</td>
<td>Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, 4 Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction</td>
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<td>5</td>
<td>Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.</td>
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<td>6</td>
<td>4 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,</td>
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<td>7</td>
<td>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</td>
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<td>8</td>
<td>useful phrases, how to ensure paper is as good as it could possibly be the first-time submission</td>
<td>4</td>
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</tbody>
</table>
Suggested Studies:
Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM.

AUDIT 1 and 2: DISASTER MANAGEMENT

Course Objectives: - Students will be able to:
learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
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

<table>
<thead>
<tr>
<th>Units</th>
<th>CONTENTS</th>
<th>Hours</th>
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</thead>
</table>
| 1     | Introduction  
Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude. | 4 |
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. | 4 |
| 3     | 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 | 4 |
| 4     | 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. | 4 |
| 5     | 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. | 4 |
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.

SUGGESTED READINGS:
Sahni, PardeepEt.Al. (Eds.),” Disaster Mitigation Experiences And Reflections”, Prentice Hall Of India, New Delhi.

AUDIT 1 and 2: SANSKRIT FOR TECHNICAL KNOWLEDGE

Course Objectives
To get a working knowledge in illustrious Sanskrit, the scientific language in the world
Learning of Sanskrit to improve brain functioning
Learning of Sanskrit to develop the logic in mathematics, science & other subjects
enhancing the memory power
The engineering scholars equipped with Sanskrit will be able to explore
the huge knowledge from ancient literature

Syllabus

<table>
<thead>
<tr>
<th>Unit</th>
<th>Content</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences</td>
<td>8</td>
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<tr>
<td>2</td>
<td>Order Introduction of roots Technical information about Sanskrit Literature</td>
<td>8</td>
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<tr>
<td>3</td>
<td>Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics</td>
<td>8</td>
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</tbody>
</table>

Suggested reading
Abhyaspustakam” – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
Teach Yourself Sanskrit” Prathama Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi.

Course Output
Students will be able to
Understanding basic Sanskrit language
Ancient Sanskrit literature about science & technology can be understood
Being a logical language will help to develop logic in students
AUDIT 1 and 2: VALUE EDUCATION

Course Objectives
Students will be able to
1. Understand value of education and self-development
   Imbibe good values in students
   Let the should know about the importance of character

Syllabus

<table>
<thead>
<tr>
<th>Unit</th>
<th>Content</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Values and self-development – Social values and individual attitudes.</td>
<td>4</td>
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<td></td>
<td>Work ethics, Indian vision of humanism.</td>
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<td>Moral and non-moral valuation. Standards and principles.</td>
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<td>Value judgements</td>
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<td>2</td>
<td>Importance of cultivation of values.</td>
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<tr>
<td></td>
<td>Truthfulness, Cleanliness.</td>
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<td>Honesty, Humanity. Power of faith, National Unity.</td>
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<td>Patriotism. Love for nature, Discipline</td>
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<td>3</td>
<td>Personality and Behavior Development - Soul and Scientific attitude.</td>
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<td>Positive Thinking. Integrity and discipline.</td>
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<td>Punctuality, Love and Kindness.</td>
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<td>Avoid fault Thinking.</td>
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<td>Free from anger, Dignity of labour.</td>
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<td>Universal brotherhood and religious tolerance.</td>
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<td>True friendship.</td>
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<td></td>
<td>Happiness Vs suffering, love for truth.</td>
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<td>Aware of self-destructive habits.</td>
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<td></td>
<td>Association and Cooperation.</td>
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<td>Doing best for saving nature</td>
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<td>4</td>
<td>Character and Competence – Holy books vs Blind faith.</td>
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<td>Self-management and Good health.</td>
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<td></td>
<td>Science of reincarnation.</td>
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<td>Equality, Nonviolence, Humility, Role of Women.</td>
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<td>All religions and same message.</td>
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<td>Mind your Mind, Self-control.</td>
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<td></td>
<td>Honesty, Studying effectively</td>
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</table>

Suggested reading

Course outcomes
Students will be able to
1. Knowledge of self-development
2. Learn the importance of Human values
3. Developing the overall personality
AUDIT 1 and 2: CONSTITUTION OF INDIA

Course Objectives:
Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

<table>
<thead>
<tr>
<th>Units</th>
<th>Content</th>
<th>Hours</th>
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</thead>
</table>
| 1     | **History of Making of the Indian Constitution:**  
History  
Drafting Committee, (Composition & Working) | 4 |
| 2     | **Philosophy of the Indian Constitution:**  
Preamble  
Salient Features | 4 |
| 3     | **Contours of Constitutional Rights & Duties:**  
Fundamental Rights  
Right to Equality  
Right to Freedom  
Right against Exploitation  
Right to Freedom of Religion  
Cultural and Educational Rights  
Right to Constitutional Remedies  
Directive Principles of State Policy  
Fundamental Duties. | 4 |
| 4     | **Organs of Governance:**  
Parliament  
Composition  
Qualifications and Disqualifications  
Powers and Functions  
Executive  
President  
Governor  
Council of Ministers  
Judiciary, Appointment and Transfer of Judges, Qualifications  
Powers and Functions | 4 |
| 5     | **Local Administration:**  
District’s Administration head: Role and Importance,  
Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.  
Elected officials and their roles, CEO ZilaPanchayat: Position and role.  
Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials.  
Importance of grass root democracy | 4 |
Suggested reading

- The Constitution of India, 1950 (Bare Act), Government Publication.

Course Outcomes:

Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

AUDIT 1 and 2: PEDAGOGY STUDIES

Course Objectives:

Students will be able to:

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

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<tr>
<th>Units</th>
<th>Syllabus</th>
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<tbody>
<tr>
<td></td>
<td><strong>Introduction and Methodology:</strong></td>
</tr>
<tr>
<td>1</td>
<td>Aims and rationale, Policy background, Conceptual framework and terminology</td>
</tr>
<tr>
<td></td>
<td>Theories of learning, Curriculum, Teacher education.</td>
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<tr>
<td></td>
<td>Conceptual framework, Research questions.</td>
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<td></td>
<td>Overview of methodology and Searching.</td>
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<tr>
<td>2</td>
<td>Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.</td>
</tr>
<tr>
<td></td>
<td>Curriculum, Teacher education.</td>
</tr>
<tr>
<td>3</td>
<td>Evidence on the effectiveness of pedagogical practices Methodology for the in depth stage: quality assessment of included studies.</td>
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<tr>
<th>Units</th>
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<td>3</td>
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</tbody>
</table>
How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
Theory of change.
Strength and nature of the body of evidence for effective pedagogical practices.
Pedagogic theory and pedagogical approaches.
Teachers’ attitudes and beliefs and Pedagogic strategies.

**Professional development: alignment with classroom practices and follow-up support**
- Peer support
  - Support from the head teacher and the community.
- Curriculum and assessment
- Barriers to learning: limited resources and large class sizes

**Research gaps and future directions**
- Research design
- Contexts
- Pedagogy
- Teacher education
- Curriculum and assessment
- Dissemination and research impact.

**Suggested reading**

**Course Outcomes:**

Students will be able to understand:
- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA

Course Objectives
To achieve overall health of body and mind
To overcome stress

Syllabus

<table>
<thead>
<tr>
<th>Unit</th>
<th>Content</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Definitions of Eight parts of yog. ( Ashtanga )</td>
<td>8</td>
</tr>
</tbody>
</table>
| 2    | Yam and Niyam. 
Do’s and Don’t’s in life. 
i) Ahinsa, satya, astheya, bramhacharya and aparigraha 
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan | 8 |
| 3    | Asan and Pranayam 
i) Various yog poses and their benefits for mind & body 
ii) Regularization of breathing techniques and its effects - Types of pranayam | 8 |

Suggested reading
‘Yogic Asanas for Group Training-Part-I” : Janardan Swami Yogabhyasi Mandal, Nagpur
“Rajayoga or conquering the Internal Nature” by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata

Course Outcomes:
Students will be able to:
Develop healthy mind in a healthy body thus improving social health also
Improve efficiency

AUDIT 1 and 2: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Course Objectives
To learn to achieve the highest goal happily
To become a person with stable mind, pleasing personality and determination
To awaken wisdom in students

Syllabus

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<tr>
<th>Unit</th>
<th>Content</th>
<th>Hours</th>
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</table>
| 1    | Neetisatakam-Holistic development of personality 
Verses- 19,20,21,22 (wisdom) 
Verses- 29,31,32 (pride & heroism) 
Verses- 26,28,63,65 (virtue) 
Verses- 52,53,59 (don’ts) 
Verses- 71,73,75,78 (do’s) | 8 |
| 2    | Approach to day to day work and duties.  
Shrimad BhagwadGeeta: Chapter 2-Verses 41, 47,48,  
Chapter 3-Verses 13, 21, 27, 35,  
Chapter 6-Verses 5,13,17, 23, 35,  
Chapter 18-Verses 45, 46, 48. | 8 |
| 3 | Statements of basic knowledge.  
Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68  
Chapter 12 -Verses 13, 14, 15, 16,17, 18  
Personality of Role model. Shrimad BhagwadGeeta:  
Chapter2-Verses 17, Chapter 3-Verses 36,37,42,  
Chapter 4-Verses 18, 38,39  
Chapter18 – Verses 37,38,63 | 8 |

**Suggested reading**

“Srimad Bhagavad Gita” by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata

Bhartrihari’s Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

**Course Outcomes**

Students will be able to

- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students.