SCHEME & SYLLABUS OF M.TECH – STRUCTURAL ENGINEERING

SCHEME & SYLLABI

OF

M.TECH
STRUCTURAL ENGINEERING

w.e.f. 2018 -2019
(as per AICTE model scheme)

DEPARTMENT OF CIVIL ENGINEERING

YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY, FARIDABAD
## Curriculum Structure – Semester-wise

### First Semester:

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>L-T-P</th>
<th>Credits</th>
<th>Marks Weightage</th>
<th>Course Type</th>
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<tbody>
<tr>
<td>MTSE 101A</td>
<td>Advanced Structural Analysis</td>
<td>3-0-0</td>
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<td>Core-I</td>
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<tr>
<td>MTSE 102A</td>
<td>Advanced Solid Mechanics</td>
<td>3-0-0</td>
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<td>MTSE 105A</td>
<td>Structural Design Lab</td>
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SCHEME & SYLLABUS OF M.TECH – STRUCTURAL ENGINEERING

**Discipline specific Elective-I**
MTSE-103A-1 Theory of Thin Plates and Shells
MTSE -103A-2 Theory and Applications of Cement Composites.
MTSE -103A-3 Theory of Structural Stability.

**Discipline specific Elective-II**
MTSE -104A-1 Analytical and Numerical Method for Structural Engineering.
MTSE -104A-2 Structural Health Monitoring
MTSE -104A-3 Structural Optimization
MTSE -104A-4 Bridge Engineering.

**Audit course 1 & 2**
AUD-01A English for Research Paper Writing
AUD-02A Disaster Management
AUD-03A Sanskrit for Technical Knowledge
AUD-04A Value Education
AUD-05A Constitution of India
AUD-06A Pedagogy Studies
AUD-07A Stress Management by Yoga
AUD-08A Personality Development through Life Enlightenment Skills
### SCHEME & SYLLABUS OF M.TECH – STRUCTURAL ENGINEERING

#### Second Semester:

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>L-T-P</th>
<th>Credits</th>
<th>Marks Weightage</th>
<th>Course Type</th>
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<td>MTSE 201A</td>
<td>FEM in Structural Engineering</td>
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<td>MTSE 203A</td>
<td>Discipline specific Elective-III</td>
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<td>MTSE 205A</td>
<td>Model Testing Lab</td>
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Discipline specific Elective-III

MTSE-203A-1  Advanced Steel Design
MTSE-203A-2  Design of Formwork
MTSE-203A-3  Design of High Rise Structures
MTSE-203A-4  Design of Masonry Structures

Discipline specific Elective-IV

MTSE -204A-1  Design of Advanced Concrete Structures
MTSE -204A-2  Advanced Design of Foundations
MTSE -204A-3  Soil Structure Interaction
MTSE -204A-4  Design of Industrial Structure
MTSE – 204A-5  Material Technology
### SCHEME & SYLLABUS OF M.TECH – STRUCTURAL ENGINEERING

#### Third Semester:

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<th>Credits</th>
<th>Marks Weightage</th>
<th>Course Type</th>
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#### Discipline specific Elective-V
- MTSE-301A-1 Design of Prestressed Concrete Structures
- MTSE-301A-2 Analysis of Laminated Composite Plates
- MTSE-301A-3 Fracture Mechanics of Concrete Structures
- MTSE-301A-4 Design of Plates and Shells

#### Open Elective
- OEC-101A Business Analytics
- OEC-102A Industrial Safety
- OEC-103A Operations Research
- OEC-104A Cost Management of Engineering Projects
- OEC-105A Composite Materials
- OEC-106A Waste to Energy

| Total        | 6-0-20 | 16   | 110  | 290  |

YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY, FARIDABAD
## Scheme & Syllabus of M.Tech – Structural Engineering

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>L-T-P</th>
<th>Credits</th>
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<td><strong>16</strong></td>
<td><strong>180</strong></td>
<td><strong>420</strong></td>
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Total Credits for the programme = 18 + 18 +16 +16 = **68**
SCHEME & SYLLABUS OF M.TECH – STRUCTURAL ENGINEERING

Semester I

MTSE-101A Advanced Structural Analysis

No. of Credits: 3
Sessional: 25 Marks
L T P Total
3 0 0 3
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

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.


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.

Course outcomes:
At the end of the course, students will be able to:
1. Analyze the skeleton structures using stiffness analysis code.
2. Use direct stiffness method understanding its limitations.
3. To understand solution of linear element.
4. Solve boundary value problems.

References:
- Matrix Analysis of Framed Structures, Weaver and Gere.
- The Finite Element Method, Desai and Able, CBS Publication.
MTSE-102A Advanced Solid Mechanics

No. of Credits: 3  Sessional: 25 Marks
L T P Total  Theory : 75 Marks
3 0 0 3  Total : 100 Marks
Duration of Exam: 3 Hours

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.

**Two-Dimensional Problems of Elasticity:** Plane Stress and Plane Strain Problems, Airy’s stress function, Two-Dimensional Problems in Polar Coordinates.

**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.

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

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

References:

MTSE-103A-1  Theory of Thin Plates and Shells

No. of Credits: 3  Sessional: 25 Marks
L T P Total
3 0 0 3

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.


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

Course Outcomes:
At the end of the course, students will be able to:
1. Use analytical methods for the solution of thin plates and shells.
2. Use analytical methods for the solution of shells.
3. Apply the numerical techniques and tools for the complex problems in thin plates.
4. Apply the numerical techniques and tools for the complex problems in shells.

References:
- Stresses in Plates and Shells, Ugural Ansel C., McGraw Hill.
- Thin Elastic Shells, Kraus H., John Wiley and Sons.
- Theory of Plates, Chandrashekhara K., Universities Press.
- Design and Construction of Concrete Shells, Ramaswamy G.S.
### MTSE-103A-2  Theory and Applications of Cement Composites

No. of Credits: 3  
Sessional: 25 Marks  
L T P  
Total: 100 Marks  
3 0 0 3  
Duration of Exam: 3 Hours  

**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:** Behaviour 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.

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

1. Formulate constitutive behaviour of composite materials – Ferrocement, SIFCON and Fibre Reinforced Concrete - by understanding their strain-stress behaviour.  
2. Classify the materials as per orthotropic and anisotropic behaviour.  
3. Estimate strain constants using theories applicable to composite materials.  
4. Analyse and design structural elements made of cement composites.
SCHEME & SYLLABUS OF M.TECH – STRUCTURAL ENGINEERING

Reference Books:

MTSE-103A-3  Theory of Structural Stability

No. of Credits: 3  Sessional: 25 Marks
L T P Total
3 0 0 3  Theory : 75 Marks
Total : 100 Marks  Duration of Exam: 3 Hours

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.

Course Outcomes: At the end of the course, students will be able to
1. Determine stability of columns and frames
2. Determine stability of beams and plates
3. Use stability criteria and concepts for analysing discrete and continuous systems,

Reference Books:

MTSE-104A-1 Analytical and Numerical Methods for Structural Engineering

No. of Credits: 3
Sessional: 25 Marks
L T P Total
3 0 0 3
Theory : 75 Marks
Total : 100 Marks
Duration of Exam: 3 Hours

Syllabus Contents:

Curve Fitting: Interpolation and extrapolation.
Solution of Nonlinear Algebraic and Transcendental Equations

Elements of Matrix Algebra: Solution of Linear Equations, Eigen Value Problems.


Finite Difference scheme: Implicit & Explicit scheme.


Course Outcomes:

1. At the end of the course, students will be able to solve ordinary and partial differential equations in structural mechanics using numerical methods.
2. Write a program to solve a mathematical problem.

Reference Books:

MTSE-104A-2  Structural Health Monitoring

No. of Credits: 3  Sessional: 25 Marks
L T P Total
3 0 0 3
Theory : 75 Marks
Total : 100 Marks
Duration of Exam: 3 Hours

Syllabus Contents:

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

**Structural Health Monitoring:** Concepts, Various Measures, Structural Safety in Alteration.

**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.

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

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

**Course Outcomes:** At the end of the course, students will be able to
1. Diagnosis the distress in the structure understanding the causes and factors.
2. Assess the health of structure using static field methods.
3. Assess the health of structure using dynamic field tests.
4. Suggest repairs and rehabilitation measures of the structure

**Reference Books:**

YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY, FARIDABAD
MTSE-104A-3  Structural Optimization

No. of Credits: 3  Sessional: 25 Marks
L T P Total  Theory: 75 Marks
3 0 0 3  Total: 100 Marks

Duration of Exam: 3 Hours

Syllabus Contents:


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

Reference Books:


2. Variational methods for Structural optimization, Cherkaev Andrej, Springer
MTSE-104A-4 BRIDGE ENGINEERING

No. of Credits: 3
Sessional: 25 Marks
L T P Total
3 0 0 3
Theory : 75 Marks
Total : 100 Marks
Duration of Exam: 3 Hours

Syllabus content:


NOTE - (use of relevant codes of practice are permitted in the examination).

Course Outcomes:
At the end of the course, students will be able to
Design and construct the road construction joints
Design bridge foundation

Reference Books:

3. IRC codes for Road bridges- IRS Sec I, II, III
4. IRS Codes of Practice for Railway bridges.
MTSE-105A    Structural Design Lab

No. of Credits: 2    Sessional: 30 Marks
L T P Total    Theory: 70 Marks
0 0 4  4    Total: 100 Marks

Syllabus Content:

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

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.
MTSE-106A  Advanced Concrete Lab

No. of Credits: 2  Sessional: 30 Marks
L T P Total
0 0 4  4

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. Behaviour of Beams under flexure, Shear and Torsion.

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 behaviour of structural/elements.

Reference Books:


No. of Credits: 2  
Sessional: 25 Marks
L  T  P  Total  
Theory : 75 Marks
2 0 0  2  
Total : 100 Marks
Duration of Exam: 3 Hours

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.


**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 the course, students will demonstrate their ability to:
1. Understand research problem formulation.
2. Analyze research related information.
3. Follow research ethics
4. Understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
5. 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.
6. 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.

Reference Books:
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
SCHEME & SYLLABUS OF M.TECH – STRUCTURAL ENGINEERING

Semester II

MTSE-201A  Finite Element Method in Structural Engineering

No. of Credits: 3  Sessional: 25 Marks
L  T  P  Total
3   0   0   3
Theory : 75 Marks
Total : 100 Marks
Duration of Exam: 3 Hours

Syllabus Contents:


**Beam Elements:** Flexure Element, Element Stiffness Matrix, Element Load Vector.

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

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

**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.

**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:**

SCHEME & SYLLABUS OF M.TECH – STRUCTURAL ENGINEERING


SCHEME & SYLLABUS OF M.TECH – STRUCTURAL ENGINEERING

MTSE-202A Structural Dynamics

No. of Credits: 3  Sessional: 25 Marks
L T P Total  Theory: 75 Marks
3 0 0  3  Total: 100 Marks

Duration of Exam: 3 Hours

Syllabus Contents:


**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.


**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.

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

**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
1. Analyze and study dynamics response of single degree freedom system using fundamental theory and equation of motion.
2. Analyze and study dynamics response of Multi degree freedom system using fundamental theory and equation of motion.
3. Use the available software for dynamic analysis.
Reference Books:

- Structural Dynamics and Introduction to Earthquake Engineering, Chopra A. K., Pearson.
- Dynamics of Structures, Humar J. L., Prentice Hall.
  Dynamics of Structures, Hart and Wong.
SCHEME & SYLLABUS OF M.TECH – STRUCTURAL ENGINEERING

MTSE-203A-1  Advanced Steel Design

No. of Credits: 3  Sessional: 25 Marks
L  T  P  Total
3   0   0   3

Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Syllabus Contents:

Properties of Steel: Mechanical Properties, Hysteresis, Ductility.

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


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.


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 - Arya A. S., Ajmani J. L., Nemchand and Bros., Roorkee.
- P. Dayaratnam, Design of Steel Structures.
- SP – 6 - Handbook of Structural Steel Detailing, BIS, 1987
MTSE-203A-2  Design of Formwork

No. of Credits: 3  Sessional: 25 Marks
L T P Total  Theory: 75 Marks
3 0 0 3  Total: 100 Marks

Duration of Exam: 3 Hours

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.

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.

Reference Books:

IS 14687: 1999, False work for Concrete Structures - Guidelines, BIS.
SCHEME & SYLLABUS OF M.TECH – STRUCTURAL ENGINEERING

MTSE-203A-3 Design of High Rise Structures

No. of Credits: 3
Sessional: 25 Marks
L T P Total
3 0 0 3
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

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. Fire fighting design provisions.

Application of software in analysis and design.

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

Reference Books:

5. Tall Building Structures, Smith Byron S. and Coull Alex, Wiley India. 1991.
MTSE-203A-4 Design of Masonry Structures

No. of Credits: 3  
Sessional: 25 Marks
L T P Total
3 0 0 3  
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

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.


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

**Reference Books:**

1. Design of Reinforced Masonry Structures, Narendra Taly, ICC, 2nd Edn,
MTSE-204A-1  Design of Advanced Concrete Structures

No. of Credits: 3  Sessional: 25 Marks
L T P Total
3 0 0 3

Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Syllabus Contents:

Design philosophy, Modeling of Loads, Material Characteristics.


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.

References Books:


YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY, FARIDABAD
MTSE-204A-2  Advanced Design of Foundations

No. of Credits: 3  Sessional: 25 Marks
L T P  Total
3 0 0  3  Theory : 75 Marks

Total : 100 Marks  Duration of Exam: 3 Hours

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

Course Outcomes: At the end of the course, students will be able to
1. Decide the suitability of soil strata for different projects.
2. Design shallow foundations deciding the bearing capacity of soil.
3. Analyze and design the pile foundation.
4. Understand analysis methods for well foundation.
Reference Books:


MTSE-204A-3  Soil Structure Interaction

No. of Credits: 3  Sessional: 25 Marks
L T P Total
3 0 0 3  Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Syllabus Contents:

- Application of Advanced Techniques of Analysis such as FEM and Finite Difference Method.
- 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.

Course Outcomes: At the end of the course, students will be able to
1. Understand soil structure interaction concept and complexities involved.
2. Evaluate soil structure interaction for different types of structure under various conditions of loading and subsoil characteristics.
3. Prepare comprehensive design oriented computer programs for interaction problems based on theory of sub grade reaction such as beams, footings, rafts etc.
4. Analyze different types of frame structure founded on stratified natural deposits with linear and non-linear stress-strain characteristics.
5. Evaluate action of group of piles considering stress-strain characteristics of real soils.
Reference Books:

4. Elastic Analysis of Soil Foundation Interaction, Developments in Geotechnical Engg. Vol-17,
MTSE-204A-4

Design of Industrial Structures

No. of Credits: 3
L T P Total
3 0 0 3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

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.


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

1. Design Steel Gantry Girders.
2. Design Steel Portal, Gable Frames.
3. Design Steel Bunkers and Silos.
4. Design Chimneys and Water Tanks.

Reference Books:

3. Design of Steel Structures, Subramaniyam.
SCHEME & SYLLABUS OF M.TECH – STRUCTURAL ENGINEERING

MTSE-204A-5 MATERIAL TECHNOLOGY

No. of Credits: 3  
Sessional: 25 Marks  
L T P Total  
3 0 0 3  
Theory: 75 Marks  
Total: 100 Marks  
Duration of Exam: 3 Hours

Course Contents:


Unit-IV: Theories of failure and yield surfaces; Fatigue properties: Nature of fatigue failure, fatigue strength for completely reversed stresses, fatigue strength with superimposed static stress and factors influencing fatigue strength;


Reference Books:


3. S P Timoshenko, Strength of materials- Part II

4. M. S. Shetty, Concrete technology- Theory & Practice, S.Chand & Company New Delhi, 2005

YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY, FARIDABAD
MTSE-205A  Model Testing Lab

No. of Credits: 2  Sessional: 30 Marks
L T P Total  Theory : 70 Marks
0 0 4 4  Total : 100 Marks

Syllabus Content:

1. Response of structures and its elements against extreme loading events.

Course Outcomes: At the end of the course, students will be able to
1. Understand the response of structures.
2. Prepare the models.
3. Conduct model testing for static loading
4. Conduct model testing for free and forced vibrations
MTSE-206A   Numerical Analysis Lab

No. of Credits: 2   Sessional: 30 Marks
L T P  Total
0  0  4  4  Theory: 70 Marks
Total: 100 Marks

Syllabus Contents:

1. Find the Roots of Non-Linear Equation Using Bisection Method.


3. Curve Fitting by Least Square Approximations.


5. Solve the System of Linear Equations Using Gauss - Seidal Iteration Method.


8. Integrate numerically using Simpson’s Rules.


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

1. Find Roots of non-linear equations by Bisection method and Newton’s method. Do curve fitting by least square approximations

2. Solve the system of Linear Equations using Gauss - Elimination/ Gauss - Seidal Iteration/ Gauss - Jorden Method.

3. To Integrate Numerically Using Trapezoidal and Simpson’s Rules

MTSE-207A Mini-project

No. of Credits: 2
L T P Total
0 0 4 4

Sessional: 30 Marks
Theory: 70 Marks
Total: 100 Marks

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.

Course Outcomes:
At the end of the course, the student will be able to:
1. Identify structural engineering problems reviewing available literature.
2. Study different techniques used to analyze complex structural systems.
3. Work on the solutions given and present solution by using his/her technique applying engineering principles.
MTSE-301A-1  Design of Prestressed Concrete Structures

No. of Credits: 3  Sessional: 25 Marks
L T P Total  Theory: 75 Marks
3 0 0 3  Total: 100 Marks
Duration of Exam: 3 Hours

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.

**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.
SCHEME & SYLLABUS OF M.TECH – STRUCTURAL ENGINEERING

References:

IS: 1343- Code of Practice for Prestressed Concrete IRC: 112
MTSE-301A-2 Analytical and Finite Element Analysis of Laminated Composite Plates

No. of Credits: 3  Sessional: 25 Marks
L T P  Total
3 0 0 3  Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

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.

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:

MTSE-301A-3  Fracture Mechanics of Concrete Structures

No. of Credits: 3  Sessional: 25 Marks
L T P Total  Theory: 75 Marks
3 0 0 3  Total: 100 Marks
Duration of Exam: 3 Hours

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.

**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.

**Reference Books:**

MTSE-301A-4: Design of Plates and Shells

No. of Credits: 3
L  T  P  Total
3  0  0  3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Syllabus Contents:

- Prismatic folded Plate Systems
- Shell Equations
- Approximate Solutions
- Analysis and Design of Cylindrical Shells
- Approximate Design methods for Doubly Curved Shells.

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.

Reference Books:

MTSE-302A   Dissertation Phase-I

No. of Credits: 10
L T P Total
0 0 20 20

Sessional: 60 Marks
Theory: 140 Marks
Total: 200 Marks

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.

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

1. Identify structural engineering problems reviewing available literature.

2. Identify appropriate techniques to analyze complex structural systems.

3. Apply engineering and management principles through efficient handling of project
Semester – IV

MTSE-401A    Dissertation Phase-II

No. of Credits: 16    Sessional: 180 Marks
LTP    Total
0 0 32  32    Theory : 420 Marks
Total : 600 Marks

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.

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

1. Solve complex structural problems by applying appropriate techniques and tools.
2. Exhibit good communication skill to the engineering community and society.
3. Demonstrate professional ethics and work culture.
OPEN ELECTIVES

OEC-101A     Business Analytics

No. of Credits: 3                      Sessional: 25 Marks
L T PTotal                      Theory : 75 Marks
3 0 0 3                      Total : 100 Marks
                                            Duration of Exam: 3 Hours

Course objective
1. Understand the role of business analytics within an organization.
2. Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
3. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decisionmaking.
4. To become familiar with processes needed to develop, report, and analyze business data.
5. Use decision-making tools/Operations research techniques.
6. Manage business process using analytical and management tools.
7. Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.


YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY, FARIDABAD
Unit 3: 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.


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

Course outcomes
1. Students will demonstrate knowledge of dataanalytics.
2. Students will demonstrate the ability of think critically in making decisions based on data and deepanalytics.
3. Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support businessdecision-making.
4. Students will demonstrate the ability to translate data into clear, actionableinsights.
Reference Books:

2. Business Analytics by James Evans, personsEducation.
SCHEME & SYLLABUS OF M.TECH – STRUCTURAL ENGINEERING

OEC-102A  Industrial Safety

No. of Credits: 3  
Sessional: 25 Marks
L T P Total
3 0 0 3  
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Course Contents:

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.

Reference Books::
SCHEME & SYLLABUS OF M.TECH – STRUCTURAL ENGINEERING

OEC-103A      Operations Research

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Course Outcomes:
At the end of the course, the student should be able to
1. Students should be able to apply the dynamic programming to solve problems of discrete and continuous variables.
2. Students should be able to apply the concept of non-linear programming
3. Students should be able to carry out sensitivity analysis
4. Students should be 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
Reference Books:

OEC-104A  Cost Management of Engineering Projects

No. of Credits: 3  Sessional: 25 Marks
L T P Total
3 0 0 3
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Course contents:


Unit 2: 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 nontechnical 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.


Reference Books:
1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, NewDelhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & CostAccounting
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co.Ltd.
OEC-105A Composite Materials

No. of Credits: 3 Sessional: 25 Marks
L T P Total Theory: 75 Marks
3 0 0 3 Total: 100 Marks
Duration of Exam: 3 Hours

Course Contents:


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:

Reference Books:
SCHEME & SYLLABUS OF M.TECH – STRUCTURAL ENGINEERING

OEC-106A Waste to Energy

No. of Credits: 3
L T P Total
3 0 0 3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Course Contents:

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 - Thermochemical 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.
Reference Books::
Audit Courses

AUD-01A  English for Research PaperWriting

Course objectives:
Students will be able to:
1. Understand that how to improve your writing skills and level ofreadability
2. Learn about what to write in each section
3. Understand the skills needed when writing aTitle

Note: Ensure the good quality of paper at very first-time submission

Course Contents:
Unit 1: Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.


Unit 3: Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.
Unit 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.

Unit 5: 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.

Unit 6: useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.
Suggested Studies:
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.

Unit 1: Introduction: Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.


Unit 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.

Unit 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.

Unit 6: 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:
2. Sahni, Pardeep Et.Al. (Eds.),” Disaster Mitigation Experiences and Reflections”, Prentice Hall Of India, NewDelhi.
SCHEME & SYLLABUS OF M.TECH – STRUCTURAL ENGINEERING

AUD-03A  Sanskrit for Technical Knowledge

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

Course Contents:
Unit 1: Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences.


Unit 3: Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Suggested reading
1. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbhastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication

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

Students will be able to

2. Imbibe good values in students.
3. Let the should know about the importance of character

Course Contents:


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
Course Objectives:
Students will be able to:
1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. 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.
3. 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.


Unit 2: Philosophy of the Indian Constitution: Preamble, Salient Features.


Unit 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.

departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

**Unit 6: Election Commission:** Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

**Suggested reading**
1. The Constitution of India, 1950 (Bare Act), Government Publication.

**Course Outcomes:**
Students will be able to:
1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. 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.
Course Objectives:
Students will be able to:
1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
2. Identify critical evidence gaps to guide the development.

Course Contents:

Unit 2: Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.


Unit 4: 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.

Unit 5: 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:
1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
Course Objectives
1. To achieve overall health of body and mind
2. To overcome stress

Course Contents:
Unit 1: Definitions of Eight parts of yog. (Ashtanga)

Unit 2 Yam and Niyam. Do’s and Don’t’s in life i) Ahinsa, satya, astheya, bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwarpasandhan

Unit 3: Asan and Pranayam i) Various yog poses and their benefits for mind & body
ii) Regularization of breathing techniques and its effects- Types of pranayama.

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

Course Outcomes:
Students will be able to:
1. Develop healthy mind in a healthy body thus improving social healthalso.
2. Improve efficiency
Course Objectives

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

Course contents

Unit 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)

Unit 2: Approach to day to day work and duties.
Shrimad Bhagwad Geeta: 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.

Unit 3: Statements of basic knowledge.
Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
Chapter 12 -Verses 13, 14, 15, 16,17, 18
Personality of Role model. Shrimad Bhagwad Geeta:
Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
Chapter 4-Verses 18, 38,39
Chapter18 – Verses 37,38,63

Suggested reading
1. “Srimad Bhagavad Gita” by Swami Swarupananda Advaita Ashram (Publication Department),
Kolkata.
2. Bhartrihari’s Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, NewDelhi.

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