ACADEMIC REGULATIONS

PROGRAM STRUCTURE

and

DETAILED SYLLABUS

Master of Technology

(Structural Engineering)

(Two Year Regular Programme)

(Applicable for Batches admitted from 2018)

Gokaraju Rangaraju Institute of Engineering and Technology

(Autonomous)

Bachupally, Kukatpally, Hyderabad- 500 090
## I YEAR - I SEMESTER

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Group</th>
<th>Course Code</th>
<th>Subject</th>
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**Total Hours:** 14
**Total Credits:** 24
**Total Marks:** 210
**Total Marks:** 490
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### I YEAR - II SEMESTER

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**Audit course 1 & 2**

1. English for Research Paper Writing (GR18D5207)
2. Disaster Management (GR18D5208)
3. Sanskrit for Technical Knowledge (GR18D5209)
4. Value Education (GR18D5210)
5. Indian Constitution(GR18D5211)
6. Pedagogy Studies (GR18D5212)
7. Stress Management by Yoga (GR18D5213)
8. Personality Development through Life Enlightenment Skills(GR18D5214).
Course Code: GR18D5164  
L/T/P/C: 3/0/0/3

Course Objectives

- To learn how to idealise statically and kinematically determinate and indeterminate structures and their ill effects.
- To learn the difference between local and global co-ordinates systems and its role in preparation of stiffness matrix.
- To understand the effective usage of stiffness matrix method in indeterminate Structures.
- To understand about static condensation and sub structuring.
- To learn about shear walls and their role in multi storied structures.

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

- Evaluate the static and kinematic indeterminacy and generate stiffness and flexibility matrices.
- Analyse the skeleton structures using stiffness method.
- Use stiffness method to analyse different structures.
- Analyse various types of structural members using special analysis procedures.
- Know the usage of shear walls in multi storied constructions.

Unit I

Unit II
Stiffness Matrix Assembly of Structures and its Applications to Simple Problems: Stiffness Matrix in Global Coordinates, Boundary Conditions, Solution of Stiffness Matrix Equations.

Unit III
Calculation of Reactions and Member Forces: Beams, Plane Trusses, Plane Rigid Jointed Frames by Stiffness method.
Unit IV
Special Analysis Procedures - Static condensation and sub structuring - initial and thermal stresses.

Unit V
Shear Walls- Necessity - structural behaviour of large frames with and without shear walls - approximate methods of analysis of shear walls.

Text Books


References Books

Course Code: GR18D5165  L/T/P/C: 3/0/0/3

Course Objectives

- To explain the theory, concepts and principles of Elasticity.
- To generalize the equations of elasticity and their correlations.
- To demonstrate the two-dimensional problems of elasticity in terms of cartesian and polar coordinates.
- To apply principles of elasticity to analyze the torsion in prismatic bars.
- To extend the principles of stress/strain for plastic deformation to study the modes of failure.

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

- Develop equations of equilibrium and draw relations among stress, strain and displacements.
- Utilize equations of elasticity such as equilibrium equations, compatibility equations and various boundary conditions to analyze elastic problems.
- Gain the understanding of two-dimensional problems of elasticity in cartesian and polar coordinates system.
- Apply the principles of elasticity to solve torsional problems in prismatic bars and tubes.
- Use the concepts of stresses and strains for plastic deformation to comprehend the yield criteria of materials.

Unit I

Introduction to Elasticity: Notation for forces and stresses - Components of stresses - Components of strain – Hooke’s law, Strain and Stress Fields, Stress and strain at a Point, Stress Components on an Arbitrary Plane, Hydrostatic and Deviatoric Components, Saint-Venant’s principle.

Unit II

Unit III

Analysis of Stress and Strain in Three Dimensions in Rectangular and Polar Coordinates - principal stresses - stress ellipsoid-determination of principal stresses - maximum shear stresses-equations of equilibrium in terms of displacements.

Unit IV


Unit V

Plasticity: Concepts of Plasticity, Plastic Deformation, Strain Hardening, Idealized Stress-Strain curve, Yield Criteria, Plastic Stress-Strain Relations.

Reference Books

Course Objectives

- To study the physical and chemical properties of cement and admixtures. And also to know about hydration and SEM analysis.
- To study the properties and conduct the tests on fresh and hardened concrete.
- To acquire the practical knowledge on mix design principles, concepts and methods.
- To get an adequate knowledge about the special concretes and their applications in the Diverse construction field.
- To design the forms of different materials for the different types of works under different conditions.

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

- List out the types of cement, admixture and decide the suitable cement and admixture for specific purpose.
- Determine the properties of concrete ingredients i.e. cement, fine aggregate and coarse aggregate by conducting different tests such as workability etc.,
- Design the mix proportion of ordinary, standard and high strength concrete by using different methods and how the strength of concrete can be modified by changing the proportions.
- Decide suitable concrete for different structures considering the prevailing weathering conditions and Design economic concrete mix proportion for different exposure conditions and intended purposes with special concrete.
- Design the forms for a specific work and decide the time of removal of forms for the different elements in different situations.

Unit I

**Concrete Making Materials:** Cement- Bogues compounds – Hydration Process– Alkali silica reaction -Admixtures – Chemical and Mineral admixtures. Studies on Micro structure of concrete and applications of SEM (Scanned Electronic Microscope).

Unit II

**Fresh and Hardened Concrete:** Fresh Concrete - workability tests on Concrete Setting times of Fresh Concrete - Segregation and bleeding. Hardened Concrete: Abram’s law- Gel space ratios, Maturity Concept – Stress Behavior – Creep and Shrinkage – Durability tests on concrete - Nondestructive testing of concrete.
Unit III

Unit IV

Unit V

Text Books
1. A.M.Neville, Properties of Concrete, ELBS publications, 4th pointing DECLO, 1996.

Reference Books
Course Code: GR18D5167

Course Objectives

- To acquire knowledge on classification and characteristics of composite material.
- To get an adequate knowledge on special concretes.
- To obtain the practical knowledge on mix design principles, concepts and methods.
- To determine the mechanical properties of cement composites.
- To get an adequate knowledge on applications in the diverse construction field.

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

- Classify and recognize an importance of the composite materials.
- Identify the type of special concrete.
- Design the mix proportion of ordinary, standard and high strength concrete by different methods.
- Determine the mechanical properties of cement composites.
- Recommend the cement composites for various applications.

Unit I


Unit II


Unit III

**Unit IV**

**Mechanical Properties of Cement Composites:** Behavior of Ferrocement, Fiber Reinforced Concrete in Tension, Compression, Flexure, Shear, Fatigue and Impact, Durability and Corrosion. Durability tests on concrete - Nondestructive testing of concrete.

**Unit V**


**Reference Books**

Course Code: GR18D5168 L/T/P/C: 3/0/0/3

Course Objectives

- To impart basics in the theory of structural stability of discrete and continuous systems.
- To analyze for stability of columns with axial, flexural, torsional, combined buckling and with and without lateral bracing.
- To analyze for stability of member buckling and global buckling in frames.
- To analyze the lateral torsion buckling in beams and the axial flexural buckling, shear flexural buckling, buckling under combined loads in plates.
- To explain the concepts of inelastic buckling and dynamic stability.

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

- Comprehend the basics in the theory of structural stability of discrete and continuous systems.
- Analyze for stability of columns with axial, flexural, torsional and combined buckling and also investigate for stability of columns with lateral bracing.
- Evaluate for stability of member buckling and global buckling in frames.
- Analyze the lateral torsion buckling in beams and for the axial flexural buckling, shear flexural buckling, buckling under combined loads in plates.
- Explain the concepts of inelastic buckling and dynamic stability.

Unit I


Unit II


Unit III

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

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

Unit V

Introduction to Inelastic Buckling and Dynamic Stability.

Reference Books

Course Code: GR18D5169
L/T/P/C: 3/0/0/3

Course Objectives

- To analyse the performance of various interpolation technique and perform error analysis.
- To develop the skill of solving linear algebraic systems by direct and iteration methods.
- To compare various numerical differentiation and integration techniques.
- To explain the various techniques to study Initial and Boundary value problems in Ordinary Differential Equations.
- To solve a range of problems on applicable software.

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

- Analyse the performance of various interpolation technique and perform error analysis.
- Solve linear algebraic system by direct and iteration methods and apply the knowledge of Eigen values and Eigen vectors to some contents in engineering.
- Apply the knowledge of interpolation and extrapolation of uniform and non-uniform data to certain contents of Civil Engineering.
- Apply the knowledge of numerical differentiation and integration to some contents of Civil Engineering.
- Solve ordinary and partial differential equations in structural mechanics using numerical methods.

Unit I

Fundamentals of Numerical Methods: Error Analysis, Floating-Point Approximation of a Number; Loss of Significance and Error Propagation; Stability in Numerical Computation.

Curve Fitting: Linear Interpolation - Higher Order Interpolation - Lagrange Interpolation Interpolating polynomials using finites differences- Hermite Interpolation -piece-wise and spline Interpolation; Richardson’s extrapolation.

Unit II

Unit III

Solution of Nonlinear Algebraic and Transcendental Equations

Bisection Method; Fixed-Point Iteration Method; Secant Method; Newton Method; Rate of Convergences; Solution of a System of Nonlinear Equations; Unconstrained Optimization.

Unit IV


Unit V

Finite Difference scheme: Implicit & Explicit scheme.


Reference Books

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRUCTURAL HEALTH MONITORING

Course Code: GR18D5170  L/T/P/C: 3/0/0/3

Course Objectives

- To make the student to understand the Health of the structure.
- To train the student to diagnose the distress due to various causes & Faults and identify the distress for documentation.
- To prepare the student to assess the health of structure using static field methods.
- To prepare the student to assess the health of structure using dynamic field tests.
- To motivate the student to suggest Repairs, Rehabilitation & Retrofitting of the structure.

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

- Understand the Health of the structure.
- Diagnose the distress due to various causes & Faults.
- Identify the distress and document.
- Assess the health of structure using static & dynamic field methods.
- Suggest Repairs, Rehabilitation & Retrofitting of the structure.

Unit I


Unit II


Unit III

Static Field Testing: Types of Static Tests, Simulation and Loading Methods, Static Response Measurement.

Unit IV


Unit V

Introduction to Repairs and Rehabilitations of Structures: electro–mechanical impedance (EMI) technique, adaptations of EMI technique.
Reference Books

Course Code: GR18D5171

Course Objectives

- To introduce the concept of optimization.
- To provide knowledge on various optimization techniques.
- To teach the applications of linear and non-linear programs.
- To teach the applications of other programming techniques.
- To understand the design concepts using optimization techniques.

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

- Formulate mathematical models for the problems in structural components to study Failures.
- Use variational principle for optimization
- Analyse problems using linear and nonlinear programming.
- Analyse problems using geometric, stochastic programming.
- Apply optimization techniques to structural steel and concrete members.

Unit I


Unit II

Calculus of Variation: Variational Principles with Constraints.

Unit III


Unit IV

Geometric Programming and Stochastic Programming.

Unit V

Applications and Design: Structural Steel and Concrete Members, Trusses and Frames. Frequency Constraint, Design of Layouts.
Text Books

1. Introduction to Optimization Techniques by Dr. S.S. Rao.
2. Introduction to operation research by Hamdy A Taha, Prentice Hall of India.

Reference Books

Course Code: GR18D5012  
L/T/P/C: 2/0/0/2

Course Objectives

- To formulate the research problem and Identify solutions for a research problem
- To realize the importance of research ethics and development of research proposal.
- To comprehend the process and procedure to apply for patents
- To grasp the understanding of the patent rights.
- To bring awareness about the IPR protection procedures

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

- Formulate the research problem and Identify solutions for a research problem
- Implement research ethics during development of research proposal.
- Have in-depth understanding of procedure to apply for patents
- Realize that when IPR would take such important place in growth of individuals & Nation.
- Emphasise the need of information about Intellectual Property Right to be promoted among students in general and engineering in particular.

Unit I


Unit II

Effective Literature Studies: Approaches, analysis Plagiarism, and Research ethics.

Unit III

Unit IV


Unit V

**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.

**Reference Books**

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
STRUCTURAL DESIGN LAB

Course Code: GR18D5172
L/T/P/C: 0/0/4/2

Course Objectives

- To make the student to understand the concept of structural design.
- To prepare the student to estimate the loads including loads given in IS 875.
- To train the student to analyze and design the framed structure.
- To train the student to design a complete Multi-Story Frame Building.
- To motivate the student to have full clarity on detailing of reinforcement.

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

- Understand the concept of structural design.
- Estimate the loads including loads given in IS 875.
- Analyze & Design the framed structure.
- Design a complete Multi-Story Frame Building.
- Have full clarity in reinforcement, curtailment, lapping etc.

Lab Design & Drawing Exercises:

Task 1
Design of all the Structural Components of Frame Buildings manually, using latest relevant IS codes and special publications of BIS.

Task 2
Detailing and preparation of drawings of all the Structural Components of Frame Buildings by individual student using latest relevant IS codes.

Task 3
Structural design of complete G+3 Multi-Storey Frame Building by Staad-Pro.

Task 4
Structural design of complete G+3 Multi-Storey Frame Building manually, using latest relevant IS codes and special publications of BIS.

Task 5
Detailing and preparation of all drawings of complete G+3 structures by individual student using latest relevant IS codes.
Course Objectives

- To analyze the stress-strain curve of high strength concrete.
- To develop correlation between cube and cylinder of high strength concrete.
- To determine the mechanical properties of high strength concrete.
- To conduct Non-Destructive testing methods on existing concrete members.
- To study the behavior of beams under flexure, shear and torsion.

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

- Design high strength concrete and study the parameters affecting its performance.
- Determine the mechanical properties and analyze the stress-strain curve of high strength concrete.
- Develop correlation between cube and cylinder of high strength concrete.
- Assess the quality of existing concrete members by Non-Destructive testing methods.
- Analyze the behavior of beams under flexure, shear and torsion.

List of Experiments/Assignments:

Task1
Conduct basic tests on cement and aggregates.

Task2
Design the mix proportions for high strength concrete.

Task3
Study the stress-strain curve of high strength concrete.

Task4
Study the correlation between cube and cylinder of high strength concrete.

Task5
Determine the split tensile strength of high strength concrete.

Task6
Determine the modulus of rupture of high strength concrete.

Task7
Study the effect of cyclic loading on steel.
**Task 8**
Determine the compressive strength of existing concrete members by Non-Destructive testing method.

**Task 9**
Assess the quality of existing concrete members by Non-Destructive testing method.

**Task 10**
Study the flow properties of self-compacting concrete.

**Task 11**
Evaluation of air content in concrete.

**Task 12**
Optimization of dosage of super plasticizer in Mortars.

**Reference Books**

Course Objectives

- To understand the usage of minimum potential energy principle and generating global stiffness matrices.
- To enable the student should learn to formulate the global load vectors for flexure elements.
- To understand the effective usage of Galerkin method and formulation of interpolation functions in finite element analysis.
- To introduce of Iso-parametric, Axi-symmetric elements and estimate error using Numerical methods.
- To understand the non-linear analysis.

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

- Use minimum potential energy principle in Finite Element Method.
- Analyse one dimensional elements like beam element using FEM approach.
- Formulate interpolation functions and evaluation of structural deformation using Galerkin approach.

- Evaluation of stress and strains in 2D, 3D elements using iso-parametric and axi-symmetric element approach.
- Predict the error using Gauss quadrature method.

Unit I


Unit II


Unit III

Unit IV


Unit V

Introduction to non–linear analysis, various methods and their limitations.

Text Books


Reference Books

Course Code: GR18D5175

Course Objectives: The objectives of this course is to make the student to
- To understand the importance of vibration analysis and modelling of dynamic systems.
- To analyze for dynamic response of single degree of freedom system subjected to different types of loading.
- To obtain the dynamic response of structures using numerical methods.
- To examine the dynamic response of multiple degree of freedom system using lumped mass and distributed mass approach.
- To illustrate the dynamic effects of wind loads, moving loads and vibrations caused by traffic, blasting and pile driving.

Course Outcomes: At the end of the course, the student will be able to
- Comprehend and model the systems subjected to vibrations and dynamic loads.
- Analyze and obtain dynamics response of single degree freedom system using fundamental Theory and equations of motion.
- Obtain dynamics response of systems using numerical methods.
- Analyze and obtain dynamics response of multi degree of freedom system idealized as lumped and distributed mass systems.
- Explain the dynamic effects of wind loads, moving loads and vibrations caused by traffic, blasting and pile driving, Industrial machinery.

Unit I


Unit II

Unit III

**Multiple Degree of Freedom System (Lumped parameter):** Selection of the degrees of freedom - Evaluation of structural property matrices - Formulation of the MDOF equations of motion - Undamped free vibrations - Solutions of Eigen value problem for determination of natural frequencies and mode shapes - Inverse Iteration Method for Determination of Natural Frequencies and Mode Shapes, Dynamic Response by Modal Superposition Method, Direct Integration of Equation of Motion.

Unit IV


**Continuous Systems:** Flexural vibrations of beams - Elementary case – Derivation of governing differential equation of motion - Analysis of undamped free vibrations of beams in flexure - Natural frequencies and mode-shapes of simple beams with different end conditions.

Unit V


**Reference Books**

2. Structural Dynamics and Introduction to Earthquake Engineering, Chopra A. K.
6. Dynamics of Structures, Hart and Wong.
Course Objectives

- To learn the behaviour and design of structural steel components.
- To study and analyse beams for stability, strength and drift.
- To study and analyse columns for stability and strength.
- To study and design steel structures/components by different design processes.
- To study and design welded and bolted connections.

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

- Describe the mechanical properties of Steel and different failure modes of structural steel and determine their design strengths.
- Analyse and design beams and columns for stability.
- Analyse and design for strength and drift.
- Design steel structures/components by different design processes.
- Design welded and bolted connections.

Unit I

Properties of Steel: Mechanical Properties, Hysteresis, Ductility.

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

Unit II

Design of Steel Structures: Inelastic bending curvature, plastic moments, design criteria, Stability, strength, drift.

Stability of Beams: Local buckling of compression flange and web, lateral torsional buckling.

Stability of Columns: Slenderness Ratio, Local Buckling of Flanges and Web, Bracing of Column about Weak Axis.

Unit III

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.
Unit IV


Unit V

**Connections:** Welded, Bolted, Location Beam Column, Column Foundation, Splices.

**Reference Books**

2. Design of Steel Structures - Arya A. S., Ajmani J. L., Nemchand and Bros., Roorkee.
GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN OF FORMWORK

Course Code: GR18D5177
L/T/P/C: 3/0/0/3

Course Objectives

- To make the student to understand the necessity and types of form work for various structures of Civil Engineering.
- To prepare the student to select proper type of form work, accessories and materials required.
- To train the student to carry out the design the form work for various structural elements like beam, slab, column, wall & foundation and for special structures like shells, retaining walls, bridges, bunkers & water tanks.
- To make the student to understand the working of flying form work like tunnel forms, slip forms and table forms.
- To motivate the students to Judge the form work failures and to assess the form work issues in multi – storey building construction through case studies.

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

- Understand the necessity and types of form work for various structures of civil Engineering and select proper type of form work, accessories and materials required.
- Design the form work for various structural elements like beam, slab, column, wall and foundation.
- Design the form work for special structures like shells, retaining walls, bridges, Sylos, bunkers & water tank.
- Understand the working of flying form work like tunnel forms, slip forms and table forms.
- Judge the form work failures from case studies.

Unit I

Introduction to formwork: Requirements and Selection of Formwork, Formwork Materials-Timber, Plywood, Steel, Aluminium, Plastic, and Accessories. Horizontal And Vertical Formwork Supports.

Unit II

Unit III
**Formwork Design for Special Structures**: Shells, Domes, Folded Plates, Overhead Water Tanks, Natural Draft Cooling Tower and Bridges.

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

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

**Reference Books & Codes**
GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DESIGN OF HIGH RISE STRUCTURES

Course Code: GR18D5178  L/T/P/C: 3/0/0/3

Course Objectives

- To make the student to understand the types and nature of High Rise Structures and the concept of design for High Rise Structures; Application of software in analysis and design.
- To train the student for analysis and design of tall structures like Transmission/TV towers, Mast and Trestles.
- To train the student for analysis and design of RCC and Steel chimneys.
- To train the student for analysis and design of tall building structures.
- To prepare the students for Reinforcement detailing of all high rise structures.

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

- Understand the concept of design for High Rise Structures and practice the design of Transmission/TV towers, Mast and Trestles.
- Analyze and design the chimneys of RCC and Steel.
- Dynamic approach to seismic design.
- Understanding IS provisions for Fire Fighting.
- Understand the application of software for analysis and design of tall building/High Rise Structures.

Unit I

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

Unit II

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

Unit III

Tall Buildings: Structural Concept, Configurations, various systems, Wind and Seismic loads, Dynamic approach.

Unit IV

Structural design considerations and IS code provisions. Firefighting design provisions.

Unit V

Application of software in analysis and design.
Reference Books

5. Tall Building Structures, Smith Byran S. and Coull Alex, Wiley India. 1991.
Course Objectives

- To give an understanding to the students of the masonry design approaches.
- To prepare the students for Analyze Reinforced Masonry Members.
- To prepare the students to determine interactions between members studies in the field of engineering.
- To motivate the student to perform elastic and inelastic analysis of masonry walls in Engineering with deep interest.
- To expose the students to check the stability of walls for public utility.

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

- Understand the masonry design approaches.
- Analyze the reinforced masonry members.
- Determine the shear strength interactions between structural members.
- Analysis of the structural stability of walls.
- Perform pushover analysis of masonry walls.

Unit I

Introduction: Historical Perspective, Masonry Materials, Masonry Design Approaches, Overview of Load Conditions, Compression Behaviour of Masonry, Masonry Wall Configurations, Distribution of Lateral Forces.

Unit II

Flexural Strength of Reinforced Masonry Members: In plane and Out-of-plane loading.

Unit III

Interactions: Structural Wall, Columns and Pilasters, Retaining Wall, Pier and Foundation.

Shear Strength and Ductility of Reinforced Masonry Members.

Unit IV

Prestressed Masonry - Stability of Walls, Coupling of Masonry Walls, Openings, Columns, Beams.
Unit V


**Text Books**
2. Design of reinforced concrete and brick masonry structures by Purushothama raj
3. Design of Masonry Structures, by AW Hendry - 2004

**Reference Books**
1. Design of Reinforced Masonry Structures, Narendra Taly, ICC, 2nd Edn,
Course Objectives

- To acquire knowledge on design of compression members
- To design reinforced concrete elements like deep beams, piles and pile caps.
- To design and detail the retaining walls and Intze type OHT.
- To design the shear walls and plain concrete walls.
- To understand IRC loadings and design of Deck Slab Bridge.

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

- Structural design of columns including slender columns.
- Design and detailing of pile foundations with pile caps and simply supported and continuous deep beams.
- Design and detailing of plain concrete walls, shear walls.
- Design and detailing of Intze type Over Head Tank, understand stability requirements of retaining walls.
- Knowledge of IRC loading and design of Deck Slab Bridge.

Unit I

Design of Compression Members: Structural requirements of compression members as per IS456:2000; Design of columns subjected to axial load, uni-axial and bi-axial bending; Slender columns.

Unit II

Design of Deep Beams: Deep beam action, reinforcement requirements, design of simply supported and continuous deep beams and detailing. Reinforcement requirements of pile foundations, design of pile foundation and design of pile cap for a group of piles.

Unit III

Design of Walls:

Plain concrete walls – Braced and unbraced walls, slenderness ratio and design of plain concrete walls.

Shear Walls – Classification of shear walls, loads in shear walls and design of shear walls.

Retaining Walls – Types of retaining walls, stability requirements of retaining wall and design of counterfort retaining wall.
Unit IV

**Design of Intze Tank:** Intze type over head tank parts and approximation of dimensions of various parts, equation for tank capacity; design and detailing Intze type OHT. Design of staging for Intze type OHT.

Unit V

**Design of Deck Slab Bridge:** RC bridge, IRC loadings- class A, B, C and AA (70R), economic span, effective width and design of Deck Slab Bridge.

**References Books**

2. Illusrate Reinforced Concrete Design, Shah & Karve.
Course Objectives

- To select the appropriate shallow foundation type by estimating the bearing capacities and allowable settlements using suitable in-situ field and lab data.
- To understand the load transfer mechanism of deep foundations and estimating the vertical and lateral capacities of pile/pile groups with analytical approaches and load tests.
- To illustrate the design of well foundations by different methods and Indian standards.
- To provide the information on different types of shoring systems for open cuts by understanding soil arching effect and estimation of tunnel pressures.
- To analyze and design of cofferdams under uplift loads with soil structure interaction.

Course Outcomes: At the end of the course, the student 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 and well foundation.
- Soil arching and estimation of tunnel support pressures.
- Analysis and design of coffer dams with soil structure interaction.

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

Unit II

Unit III
Unit IV

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.

Unit V


Reference Books

Course Objectives: The objectives of this course is to make the student

- To understand the behaviour of soil.
- Application of Finite Element Method and Finite Difference Method.
- To Preparation of Comprehensive Design Oriented Computer Programs.
- To Analysis of Different Types of Frame Structures.
- To Determine the Pile Capacities.

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

- Understand soil structure interaction concept and complexities involved.
- Application of Advanced Techniques of Analysis such as Finite Element Method and Finite Difference Method.
- Analyze soil-structure interaction considering different Models for various soil conditions.
- 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.

Unit I

Critical study of conventional methods of foundation design, Nature and complexities of soil structure interaction.

Unit II

Application of advanced techniques of analysis such as Finite Element Method and Finite Difference Method. Relaxation and Interaction for the evaluation of soil structure interaction for different types of structure under various conditions of loading and subsoil characteristics.

Unit III

Preparation of comprehensive design oriented computer programs for specific problems, Interaction problems based on theory of sub grade reaction such as beams, footings, rafts etc.

Unit IV

Analysis of different types of frame structures founded on stratified natural deposits with Linear and Non-linear stress-strain characteristics.
Unit V

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

Course Objectives: The objectives of this course is to make the student

- To Analyse and Design Steel Gantry Girders.
- To Analyse and Design Steel Portal Frames and Gable Frames.
- To Analyse and Design Steel Bunkers and Silos.
- To Analyse and Design Chimneys.
- To Analyse and Design Water Tanks.

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

- Design Steel Gantry Girders.
- Design Steel Portal Frames and Gable Frames.
- Design Steel Bunkers and Silos.
- Design Chimneys.
- Design Water Tanks.

Unit I

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.

Unit II

Portal Frames – Design of portal frame with hinge base, design of portal frame with fixed base - Gable Structures – Light weight Structures.

Unit III


Unit IV

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.
Unit V


**Reference Books**

3. Design of Steel Structures, Subramaniyam.
Course Objectives: The objectives of this course is to make the student
- To idealize the effect of structures against extreme loading.
- To idealize the response of structure under different loading.
- To learn about free and forced vibration.
- To know the advantage of shear walls.
- To know the usage of isolation of foundations under vibrations.

Course Outcomes: At the end of the course, the student will be able to
- Evaluate the response of structure under Static and Dynamic loading.
- Generate and analyze the various structure for free and forced vibrations against prepared models using appropriate software’s.
- Develop models and test for Static and Dynamic loading.
- Develop models and test for force and free vibrations.
- Check the stability of shear walls against lateral loading.

Task 1
Generate models like shear walls, portal frames etc., and using appropriate software’s.

Task 2
Model testing for frames.

Task 3
Modal testing of plates, shells under static loading.

Task 4
Modal testing for free and forced vibrations on frames.

Task 5
Evaluation of dynamic modulus for given structure under loading.

Task 6
Assess the capacity of shear walls under lateral loading.
Course Code: GR18D5185  L/T/P/C: 0/0/4/2

Course Objectives: The objectives of this course is to make the student
- To find Roots of non-linear equations by Bisection method and Newton’s method.
- To do curve fitting by least square approximations.
- To 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.

Course Outcomes: At the end of the course, the student 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.
- Integrate Numerically Using Trapezoidal and Simpson’s Rules.

Task1
Find the Roots of Non-Linear Equation Using Bisection Method.

Task2
Find the Roots of Non-Linear Equation Using Newton’s Method.

Task3
Curve Fitting by Least Square Approximations.

Task4
Solve the System of Linear Equations Using Gauss - Elimination Method.

Task5
Solve the System of Linear Equations Using Gauss - Seidal Iteration Method.

Task6
Solve the System of Linear Equations Using Gauss - Jorden Method.
Task7
Integrate numerically using Trapezoidal Rule.

Task8
Integrate numerically using Simpson’s Rules.

Task9
Numerical Solution of Ordinary Differential Equations by Euler’s Method.

Task10
Course Code: GR18D5190 L/T/P/C: 2/0/0/2

Course Objectives:

- To understand the behaviour and properties of various materials
- To provide knowledge in contemporary software’s
- To estimate the ultimate strength and failures due to application of loads.
- To assess the behaviour of materials under different load applications.
- To analyse behaviour of complex structures using software’s and analytical procedures.

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

- Identify structural engineering problems reviewing available literature.
- Demonstrate the project results with real application for sustainable constructions sustainable environment techniques.
- Study different techniques used to analyse complex structural systems.
- Describe about solutions highlighting individuals’ contribution and present solution by using his/her technique applying engineering principles.
- Justify the results of selected project at the end of semester

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 Code: GR18D5186

L/T/P/C: 3/0/0/3

Course Objectives: The objectives of this course is to make the student
- To develop an advanced understanding regarding behaviour of pre stressing members.
- To be able to perform in analysis and design statically determinate PSC members.
- To demonstrate the stresses with anchorage system in pre stressed concrete members.
- To be able to perform in analysis and design statically indeterminate PSC members.
- To be able to perform in analysis and design of precast and pre stress composite constructions.

Course Outcomes: At the end of the course, the student will be able to
- Find out losses in the pre-stressed concrete. Understand the basic aspects of pre stressed concrete fundamentals, including pre and post-tensioning processes.
- Analysis and Design for ultimate strength of statically determinate pre stressed concrete structures.
- Design of end blocks for pre stressed members.
- Analysis and Design for ultimate strength of statically indeterminate pre-stressed Concrete structures.
- Design composite structures using pre-stressed concrete

Unit I

Introduction to pre-stressed concrete: types of pre-stressing, systems and devices, materials,

Losses in prestress, Analysis of PSC flexural members, basic concepts, stresses at transfer and service loads, ultimate strength in flexure, code provisions.

Unit II

Statically determinate PSC beams: Design for ultimate and serviceability limit states for

Flexure, analysis and design for shear and torsion, code provisions.

Unit III

Transmission of pre-stress in pre-tensioned members; Anchorage zone stresses for posttensioned members.
Unit IV

**Statically indeterminate structures**: Analysis and design - continuous beams and frames, choice of cable profile, linear transformation and concordancy. Analysis and design of prestressed concrete pipes, columns with moments

Unit V

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.

Text Books

2. Prestressed Concrete by N.Rajasekharan, Narosa Publications.

Reference Books

4. IS: 1343- Code of Practice for Prestressed Concrete.
5. IRC: 112.
Course Code: GR18D5187

Course Objectives: The objectives of this course is to make the student
- To analyse the rectangular composite plates using the analytical methods.
- To understand the governing equations for different boundary conditions.
- To know the Analytical Solutions for Bending of Rectangular Laminated Plates Using FSDT.
- To analyse the composite plates using advanced finite element method.
- To analysis of Rectangular Composite Plates using Analytical Methods.

Course Outcomes: At the end of the course, the student will be able to
- Analyse the Displacement Field Approximations for CLPT and FSDT.
- Analyse the Solutions for Bending of Rectangular Laminated Plates using CLPT.
- Analyse the Naiver Solutions of Cross-Ply and Angle-Ply Laminated Simply-Supported Plates.
- Understand the Finite Element Solutions for Bending of Rectangular Laminated Plates using CLPT and FSDT.
- Develop the computer programs for the analysis of composite plates.

Unit I

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

Unit II


Unit III

Unit IV

**Finite Element Solutions for Rectangular Laminated Plates**: Finite Element Solutions for Bending of Rectangular Laminated Plates using FSDT.

Finite Element Model, C0Element Formulation, Post Computation of Stresses.

Unit V

**Analysis of Rectangular Composite Plates**: Analysis of Rectangular Composite Plates using Analytical Methods.

Text Books


Reference Books

1. Laminated Composites Plates and Shells, Jianqiao, Ye, Springer, London
Course Code: GR18D5188

Course Objectives: The objectives of this course is to make the student

- To apply knowledge of fracture mechanics to identify crack pattern in concrete structures.
- To identify different crack patterns & crack locations in structures.
- To apply knowledge of continuum mechanics to prepare crack & band models.
- To apply crack concepts & numerical modelling to high strength concrete & fibre reinforced concrete.
- To study crack criteria by using Griffith’s Criteria, Stress Intensity Factors, R curves.

Course Outcomes: At the end of the course, the student 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.
- Analyze Crack pattern & types of cracks.

Unit I

Introduction: Basic Fracture Mechanics, Crack in a Structure, Mechanisms of Fracture.

Unit II

Study of Cracks: Crack Growth, Cleavage Fracture, Ductile Fracture, Fatigue Cracking, Environment assisted Cracking  Service Failure Analysis

Unit III

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.

Unit IV

Unit V

Applications: Applications to High Strength Concrete, Fiber Reinforced Concrete, Crack Concepts and Numerical Modeling.

Reference Books

Course Objectives: The objectives of this course is to make the student

- To achieve fundamental understanding of the classical theory of elastic plates and introduce analytical, numerical solution techniques in thin plate theory
- To apply theory of plates to the problems involving various geometrics and boundary conditions.
- To apply Navier and Levi’s method to plates with different end conditions.
- To know different theories and procedure for analysis of shells.
- To know design procedure for different shells.

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

- Analyse bending of plates and understand small deflection theory
- Analyse plates using Navier’s and Levi’s method.
- Analyse Circular plates.
- Use appropriate theory to analyse the shell structure.
- Design shell structures of singly curved and doubly curved.

Unit I

Cylindrical Bending: Different kind of plates – Assumptions - Derivation of differential equation for cylindrical bending of long rectangular plates - Analysis of uniformly loaded rectangular plates with edges simply supported and fixed subjected to uniform load.

Pure Bending of Plates: Slope and curvature of slightly bent plates – Relations between moments and curvature - Particular cases of pure bending - Strain energy in pure bending – Energy methods like Ritz and Galerkin Methods to rectangular plates subjected to simple loadings.

Unit II

Small Deflection Theory of Thin Rectangular Plates : Assumptions – Derivation of governing differential equation for thin plates- Boundary conditions- supported plate under simply sinusoidal load- Navier’s solution- Application to cases – Levy’s solution for various boundary conditions subjected to different loadings like uniform and hydrostatic pressure.

Unit III

Circular Plates : Symmetrical loading – Relations between slope, deflection, moments and curvature – Governing differential equation – Uniformly loaded plates with clamped and simply supported edges – Central hole – bending by moments and shearing forces uniformly distributed.
Unit IV

Unit V
Derivation of the governing DKJ equation for bending theory. Schorer’s theory, to the analysis and design of short and long shells. Beam theory of cylindrical shells: Beam and arch action, Analysis using beam theory.

**Introduction to the shells of Double curvatures**: Geometry, analysis and design of elliptic paraboloid, conoid and hyperbolic paraboloid shapes and inverted umbrella type.

**Text Books**

**Reference Books**
4. N.K. Bairagi, Shell Analysis.
5. Dr. N. Krishna Raju, Advanced R.C Design.
Course Objectives: The objectives of this course is to make the student
- To identify the topic by reviewing literature.
- To develop methodology to carry project thesis work.
- Based on the topic, setting objectives to carryout project thesis work
- To identify the topic by conferences
- To identify the topic by journals

Course Outcomes: At the end of course, the student will be able to
- Identify topics in thrust areas of Structural engineering and use appropriate techniques to analyze complex structural systems.
- Take up critical review of literature on the chosen topic
- Carryout independent research work on the topic by experimental / analytical approaches for structural engineering problems reviewing available literature.
- Apply engineering and management principles through efficient handling of project
- Documentation and presentation of the research work

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.
Course Objectives: The objectives of this course is to make the student
- To identify the topic by reviewing literature
- To develop methodology to carry project thesis work
- To carryout project thesis work based on the chosen topic
- To identify the topic by conferences
- To carryout experimental/analytical programme and critical analysis of results on the identified topic in thrust areas of Structural engineering.

Course Outcomes: At the end of course, the student will be able to
- Exhibit good communication skill to the engineering community and society.
- Demonstrate professional ethics and work culture.
- Carryout independent research work on the topic by experimental or analytical approaches with engineering and management principles through efficient handling of project.
- Identify structural engineering problems and apply the principles, tools and techniques to analyze complex structural systems using appropriate techniques.
- Apply Prepare document and critical analysis of the results of research work and presentation

Syllabus Contents:

Dissertation – II will be extension of the 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 pre submission 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 Code: GR18D5201  L/T/P/C: 3/0/0/3

Course objectives
- Understand the role of business analytics and statistical tools used within an organization.
- Discuss Trendiness and Regression Analysis and different visualization techniques to explore data.
- Describe the organization structure and different type of business analytics.
- Know Forecasting Techniques, Monte Carlo Simulation and Risk Analysis.
- Understanding decision analysis and recent trends in business intelligence.

Course Outcomes
- Demonstrate business analytics process and use statistical tools for implementation of business process.
- Design relationships and trends to explore and visualize the data.
- Examine the organization structure of business analytics and categorize types of analytics.
- Apply forecasting techniques, monte carlo simulation and risk analysis.
- Formulate decision analysis and summarize recent trends in business intelligence.

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

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

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

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

Unit V
Reference Books

Course Objectives

- To understand the importance of maintaining a safe workplace.
- To maintain safety standards in compliance with regulatory requirements and within engineering limits understand personal safety and industrial safety.
- To create a job safety analysis (JSA) for a given work project.
- To follow safety recordkeeping and management, and the role of the safety manager.
- To utilize personal proactive equipment.

Course outcomes: After successful completion of the course the student will be able to

- Understanding of safety principles.
- Analyze different types of exposure and biological effects, exposure guidelines and basic workplace monitoring ability to do hazard analysis.
- Demonstrate an understanding of workplace injury prevention, risk management, and incident investigations.
- Understand the acute and chronic health effects of exposure to chemical, physical and biological agents in the workplace.
- Demonstrate knowledge of the types of hazards, planning, organization and training needed to work safely with hazardous materials.

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 III: WEAR AND CORROSION AND THEIR PREVENTION

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 Books


Course Code: GR18D5203  L/T/P/C: 3/0/0/3

Course objectives

- To define and formulate linear and non-linear programming problems and appreciate their limitations arising from a wide range of applications.
- To perform sensitivity analysis to determine the direction and magnitude of change of a model’s optimal solution as the data change.
- To distinguish various inventory models and develop proper inventory policies.
- To solve the scheduling and sequencing models.
- To understand how to model and solve problems using dynamic programming, game theory.

Course Outcomes

- The student will formulate and solve problems as networks and graphs for optimal allocation of limited resources such as machine, material and money.
- The student will be able to carry out sensitivity analysis.
- The student will solve network models like the shortest path, minimum spanning tree, and maximum flow problems.
- The student will be able to distinguish various inventory models and develop proper inventory policies.
- The student will also propose the best strategy using decision making methods under uncertainty and game theory.

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

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

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

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


Reference Books

Course Objectives

- To provide the student with a clear understanding of strategic cost management process.
- To describe the various stages of project execution.
- To prepare the project schedule by bar charts and network diagram.
- To conduct breakeven and cost-volume-profit analysis.
- To make students various budgets and quantitative techniques used for cost management.

Course outcomes

- The student will be able to explain the various cost concepts used in decision making.
- To be able to identify and demonstrate various stages of project execution.
- The students will be able to prepare the project schedule by bar charts and network diagrams.
- The student will be to differentiate absorption costing and marginal costing, also conduct breakeven and cost-volume-profit analysis.
- The student will be able to prepare various budgets and quantitative techniques used for cost management.

Unit I


Unit II

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

Unit III


Unit IV

Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

Unit V


Reference Books

2. Charles T. Horngren and George Foster, Advanced Management Accounting.
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co.Ltd.
COMPOSITE MATERIALS

Course Code: GR18D5205   L/T/P/C: 3/0/0/3

Course objectives: The objectives of this course is to provide the students,

- To understand the concepts of fundamental science and engineering principles relevant to materials engineering.
- To expose the various methods to test mechanical properties on materials.
- To categorize the various equilibrium diagrams and describe the changes which occurs on metals.
- To explain the concepts on various heat treatment operations.
- To explain the various ferrous and non-ferrous metals with their properties and applications.

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

- Relate crystal structures and identify the relation between different materials.
- Test the various mechanical properties of metal by suitable method.
- Relate the equilibrium transformation diagram for various ferrous and non-ferrous metals.
- Utilize appropriate techniques in treating with proper heat treatment operation.
- Evaluate the behavior of material when it subjected to heat treatment process.

Unit I: INTRODUCTION


Unit II: REINFORCEMENTS


Unit III: MANUFACTURING OF METAL MATRIX COMPOSITES

Unit IV: MANUFACTURING OF POLYMER MATRIX COMPOSITES


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

Course Code: GR18D5206  
L/T/P/C: 3/0/0/3

Course Objectives

- To find or recall the non-hazardous secondary materials from waste.
- To compare precisely to overcome the cost and most economically attractive course of action for CH4 emission.
- To demonstrate the techno-economic feasibility of replacing.
- To extend the students for possible future activity in a biomass plant.
- To utilization in spark-ignited internal combustion engine.

Course outcomes

- Students are able to make use of energy installation and the small of household bio-waste incineration.
- To develop actual dimension must of course, fit requirement of the masonry block.
- To become capable of analyze and design of energy conversion system.
- Students are to estimate the possibility of invest in biomass generation.
- Students will be able to explain the biogas its uses and benefits.

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 II: BIOMASS PYROLYSIS

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

Unit III: BIOMASS GASIFICATION

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.

Reference Books

Course Code: GR18D5207 
L/T/P/C: 2/0/0/2

Course objectives
- To state how to put research on paper.
- To demonstrate how to write an abstract.
- To apply the process of research.
- To appraise the key skills involved in writing the title, abstract, introduction and review of literature.
- To compose a paper which is good and has the qualities of acceptance and publication.

Course Outcomes
- Will be able to understand how to write a research paper.
- Will outline the drafting of an abstract.
- Will acquire the skills of various elements of research.
- Will be in a position to write a good paper.
- Will result in increasing the chance of publication.

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

Unit II

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

Unit IV
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 V
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 Conclusion.
Reference Books

Course objectives

- 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.

Course Outcomes

- Capacity to integrate knowledge and to analyze, evaluate and manage the different public health aspects of disaster events at a local and global levels, even when limited information is available.
- Capacity to describe, analyze and evaluate the environmental, social, cultural, economic, legal and organizational aspects influencing vulnerabilities and capacities to face disasters.
- Capacity to work theoretically and practically in the processes of disaster management (disaster risk reduction, response, and recovery) and relate their interconnections, particularly in the field of the Public Health aspects of the disasters.
- Capacity to manage the Public Health aspects of the disasters.
- Capacity to obtain, analyze, and communicate information on risks, relief needs and lessons learned from earlier disasters in order to formulate strategies for mitigation in future scenarios with the ability to clearly present and discuss their conclusions and the knowledge and arguments behind them.

Unit I: INTRODUCTION

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

Unit II: REPERCUSSIONS OF DISASTERS AND HAZARDS

Unit III: 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 IV: 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 V: RISK ASSESSMENT


Reference Books

2. Sahni, Pardeep Et.Al. (Eds.),” Disaster Mitigation Experiences and Reflections”, Prentice Hall Of India, NewDelhi.
Course Code: GR18D5209

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.

Course Outcomes
- Understanding basic Sanskrit alphabets and understand tenses in Sanskrit Language.
- Enable students to understand roots of Sanskrit language.
- Students learn engineering fundamentals in Sanskrit.
- Students can attempt writing sentences in Sanskrit.
- Ancient Sanskrit literature about science & technology can be understood.

Unit I
Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

Unit II
Order, Introduction of roots, Technical information about Sanskrit Literature

Unit III
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Reference Books
1. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vemati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
Course Code: GR18D5201  
L/T/P/C: 2/0/0/2

Course objectives

• Understand value of education and self-development.
• Imbibe good values in students.
• Let the students know about the importance of character.
• To understand the significance of human conduct and self-development.
• To enable students to imbibe and internalize the value and Ethical behaviour in personal and professional lives.

Course outcomes

• Knowledge of self-development.
• Learn the importance of Human values.
• Developing the overall personality.
• Student will be able to realize the significance of ethical human conduct and self-development.
• Students will be able to inculcate positive thinking, dignity of labour and religious tolerance.

Unit I

Values and self-development – Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non-moral valuation, Standards and principles, Value judgement.

Unit II

Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline

Unit III

Personality and Behavior Development - Soul and Scientific attitude, Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship, Happiness vs suffering, love for truth, Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature.
Unit IV


Reference Books

Course Code: GR18D5211  L/T/P/C: 2/0/0/2

Course objectives

- 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.
- To understand the role and functioning of Election Commission of India.

Course outcomes

- 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.
- Discuss the significance of Election Commission of India.

Unit I: HISTORY OF MAKING OF THE INDIAN CONSTITUTION

History Drafting Committee, (Composition & Working).

Unit II: PHILOSOPHY OF THE INDIAN CONSTITUTION

Preamble Salient Features.

Unit III: CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES

Unit IV: 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.

Unit V: LOCAL ADMINISTRATION


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.

Reference Books

1. The Constitution of India, 1950 (Bare Act), Government Publication.
Course Code: GR18D5212  L/T/P/C: 2/0/0/2

Course objectives
- 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.
- Establishing coordination among people in order to execute pedagogy methods.
- To study pedagogy as a separate discipline.

Course Outcomes
- What pedagogical practices are being used by teachers in formal classrooms in developing countries?
- What pedagogical practices are being used by teachers in informal classrooms in developing countries?
- Synergy from the work force.
- 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?

Unit I: INTRODUCTION AND METHODOLOGY

Unit II: THEMATIC OVERVIEW
Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

Unit III: EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES
Methodology for the in-depth stage: quality assessment of included studies. 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.
Unit IV: 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 V: RESEARCH GAPS AND FUTURE DIRECTIONS

Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

Reference Book

Course Code: GR18D5213

Course objectives

- To achieve overall Good Health of Body and Mind.
- To lower blood pressure and improve heart health.
- To become non-violent and truthfulness.
- To increase the levels of happiness.
- To eliminate all types of body pains.

Course outcomes

- Develop healthy mind in a healthy body thus improving social health also improve efficiently.
- Develop body awareness. Learn how to use their bodies in a healthy way. Perform well in sports and academics.
- Will balance, flexibility, and stamina, strengthen muscles and connective tissues enabling good posture.
- Manage stress through breathing, awareness, meditation and healthy movement.
- Build concentration, confidence and positive self-image.

Unit I
Definitions of Eight parts of yog. (Ashtanga)

Unit II
Yam and Niyam. Do’s and Don’t’s inlife. Ahinsa, satya, astheya, bramhacharya andaparigraha Shaucha, santosh, tapa, swadhyay,ishwarpranidhan

Unit III
Asan and Pranayam, Various yog poses and their benefits for mind & body. Regulation of breathing techniques and its effects-Types of pranayam

Reference Books
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 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
- To differentiate three types of happiness (Sukham)
- To describe the character traits of a spiritual devotee

Course outcomes

- Study of Shrimad Bhagwad-Gita 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
- To develop self-developing attitude towards work without self-aggrandizement
- To develop tranquil attitude in all favorable and unfavorable situations
- To develop high spiritual intelligence

Unit I: 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 II: 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 III: 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 BhagwadGeeta: Chapter2- Verses 17, Chapter 3-Verses36,37,42,
- Chapter 4- Verses 18,38,39
- Chapter 18 – Verses37,38,63
Reference Books

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, New Delhi.