NOTIFICATION

No. 143 /2024 Dated : 28/10/2024

Subject : Implementation of the new syllabus of Semester I to IV of the new Post Graduate Course M.E. (Computer Aided Structural Engineering) as per CBCS Pattern.

It is notified for general information of all concerned that the authorities of the University have accepted to implement the new syllabus of Semester I to IV of the new Post Graduate Course M.E. (Computer Aided Structural Engineering)as per CBCS Pattern to be implemented from the academic session 2024-2025 onwards in phase wise manner as mentioned below:

Sd/-
(Dr.A.M.Asanare)
Registrar
Sant Gadge Baba Amravati University

DRAFT SYLLABUS FOR ME IN COMPUTER AIDED STRUCTURAL ENGINEERING [C.B.C.S.]

SEMESTER-I

1SFCA01: STRUCTURAL DYNAMICS

Course Objectives:

1. To make student aware about concepts of dynamics applicable to buildings.
2. To understand the concept of dynamic loads and its impacts on SDOF and MDOF system.

Course Outcomes: 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.

SYLLABUS

Unit I: Single degree freedom system

Single degree freedom system: Free vibrations, damped free vibrations, critical damping, and response, periodic loading expressed in harmonics, dynamic load factor.

Unit II: Single degree freedom system

Single degree freedom system: Response to impulsive loading, rectangular, triangular pulses, Duhamel Integral, Response to general dynamic loading, Numerical schemes such as Wilson-Theta, Newmark-Beta, constant linear acceleration & time domain and frequency domain analysis.

Unit III: Multi-degree freedom system

Multi-degree freedom system, stiffness and flexibility approaches, Lumped mass matrix, free vibrations fundamental Frequencies and mode shapes, orthogonality of modes, response to dynamic loading, numericals to find mode shapes and frequencies.

Unit IV: Multi-degree freedom system

Formulations of equations of motion, mode superposition method, modal matrix, numerical of iteration method.

Unit V: Vibration of Continuous Systems

Free vibrations of Continuous systems axial and transverse vibration of bars / beams.Response of continuous systems to dynamic loads.Rayleigh-Ritz method.

Unit VI: Structural response to earthquake

Structural response to earthquake, Response spectrum design earth quake, IS code provisions for multistory frames.

Reference Books:

1. Chopra, A. K.; Dynamics of Structures; Prentice Hall; 1995
2. Clough, R.W.; &Penzin, J.; Dynamics of Structures; McGraw Hill; 1993
3. Humar J. L.; Dynamics of Structures; Prentice Hall; 1990
4. Mario, Paz; Structural Dynamics; CBS Publ.; N-Delhi; 1995
5. Timoshenko, S.; Advanced Dynamics; McGraw Hill Book Co; NY; 1948
6. Meirovitch L.; Elements of Vibration Analysis; 2nd Edition; McGraw Hill International Edition; Singapore; 1986
7. Biggs, J.M.; Introduction to Structural Dynamics; McGraw Hill; NY; 1964

1SFCA02: ADVANCED STRUCTURAL ANALYSIS

Course Objectives:
To analyze structural engineering systems by various approaches Stiffness Method (Systems Approach): Basis of stiffness method, Degrees of freedom, Force displacement relationships, nodal stiffness. Coordinate systems and Equation solver.

Course Outcomes (CO):
The students will be able to:

- Develop the stiffness matrix of the structures and analyze them
- Develop the flexibility matrix of the structures and analyze them using force methods
- To transform metrices from local to global for various structures
- Carry out analysis of columns and beam-columns for various end conditions.

SYLLABUS

Unit I: INTRODUCTION:-Indeterminacy-Determination of static and kinematic indeterminacies of Two-Dimensional and Three-Dimensional portal frames, Pin Jointed Trusses and Hybrid Frames-Coordinate Systems – Structural Idealization. Introduction to Matrix Methods of Analysis-Flexibility and Stiffness matrices force Displacement relationships For Axial Force, Couple, torsional Moments – Stiffness Method of analysis and Flexibility Method of Analysis.

Unit II: ANALYSIS OF CONTINUOUS BEAMS- Stiffness Method and Flexibility Method of Analysis – Continuous Beams Of Two And Three Spans With Different End Conditions-Internal Hinges.

Unit 1II: ANALYSIS OF TWO DIMENSIONAL PORTAL FRAMES & PIN JOINTED TRUSSES – Stiffness And Flexibility Method Of Analysis Of 2D Portal Frames With Different End Conditions-Plotting Of Bending Moment Diagrams. Computation of Joint Displacement and Member Forces for Pin jointed Trusses.

Unit IV: TRANSFORMATION OF CO-ORDINATES - Local and Global Co-Ordinate Systems-Transformation of Matrices from local to Global coordinates of Element Stiffness Matrix-Direct Stiffness Method of analysis - assembly of Global Stiffness Matrix from Element Stiffness Matrices –Static Condensation Sub-Structuring.

Unit V: EQUATION SOLVERS-Solution of System of Linear Algebraic Equations Direct Inversion Method-Gauss Elimination Method-Cholesky Method-Banded Equation Solvers-Frontal Solution Technique.

Unit VI: Advanced Topics and Structures- a.Member Releases - Hinges b. “Secondary Effects” – Support Displacement, Temperature Change, Member Misfit c. Shear effects (Timoshenko Beam Theory) d. Matrix Condensation

Reference Books:

1. Structural Analysis By Pundit & Gupta, Tata MC Graw Hill Book Company.
2. Structural Analysis By C.S.Reddy, Tata MC Graw Hill Book Company
3. Cotes, R.C., Couties, M.G., And Kong, F.K., Structural Analysis, ELBS.
4. MC.Guire, W.,And Gallagher, R.H., Matrix Structural Analysis, John Wiley And Sons
5. John L.Meek., Matrix Strucstural Analysis, MC Graw Hill Book Company.

1SFCA03: ADVANCE DESIGN OF STEEL STRUCTURES

Course Objectives:
To design the steel structures like chimneys, bridges, industrial sheds and girders.

Course Outcomes: On completion of course, the student

1. will be able to get the Knowledge about the design of eccentric connections.
2. will be able to design of steel chimneys.
3. will be able to design of industrial sheds, bridges of crane / gantry Girders.
4. will be able to design of bridges-highway and railways.
5. will be able to design of storage vessels

SYLLABUS

Unit I: Design of eccentric connections.
Unit II: Design of steel chimneys,
Unit III Design of industrial sheds, bridges of crane / gantry Girders.
Unit IV: Design of bridges – highway and railways. Foot Bridge.
Unit V: Design of storage vessels
Unit VI: Design of Cold formed light gauges steel sections.

Reference Books:

1. Ram Chandra Design of Steel structures Vol-I &Vol-II Std. book house / Rajsons Publication Pvt. Ltd., Delhi, 2006
2. Gaylords, E.H. &Gaylords, C. N., Design of Steel Structures, Blackwell, 1994.
3. Dayaratnam P., Design of Steel Structures, Wheeler Publications, Allahabad, 1992
4. Ghosh, ― Analysis and Design practice of Steel Structure‖, (Forthcoming), Phi Publisher,New Delhi.

1SFCA04: PROF. ELECTIVE 1 (i) THEORY OF ELASTICITY & ELASTICS STABILITY

Course Objectives:

1. Analyze the stress and strain in two and three dimensions.
2. Analyze the buckling/ bending in beams and columns in various situations.

Course Outcome:

1. The student will be able to design & analysis of stress and strain in 2 dimensions
2. The student will be able to Design & analysis of stress and strain in 3 dimensions.
3. The student will be able to analysis bending of cantilever beam and simply supported beam.
4. The student will be able to understand buckling of simply supported rectangular plates.
5. The student will be able to understand buckling of columns.

SYLLABUS

Unit I: Analysis of Stress and strain in 2 dimensions: Introduction, Types of forces, Components of Stresses and strains, Stress-strain relation, Plane stress and plane strain strain at a point, Differential equation of equilibrium, Boundary conditions and compatibility equations(rectangular coordinates), Airy's stress function.

Unit II: Analysis of stress and strain in 3 dimensions: Components of stress, principal stresses, stress invariants, Maximum shearing stress, Differential equation of equilibrium, Boundary conditions and compatibility equations.

Unit III: Bending of cantilever of narrow rectangular section loaded at end, Bending of simply supported beam with uniform load, torsion of non-circular sections, Elliptical cross section.

Unit IV: Differential equation for beam, columns with concentrated loads, continuous lateral loads and couples for simply supported ends, Application of trigonometric series, Lateral bucking of beams. Buckling of simply supported rectangular plates uniformly compresses in middle plane.

Unit V: Energy method for elastic buckling of columns, Approximate method, Buckling of columns on elastic foundation, Columns with intermediate compressive forces and distributed axial load, Columns with changes in cross section. Effect of shearing force on critical load, Buckling of built up columns,

Reference Books:

1. Timoshenko, S.P. and Goodier, J.N., Theory of Elasticity, 3rd Edition, Mc-Graw Hill BookCompany, New Delhi, 1963
2. Timoshenko, S.P. and Gere J. M., Theory of Elastic Stability , 2nd Edition, Mc-Graw Hill BookCompany, New Delhi,1963
3. Ameen, M., Computational Elasticity—Theory of Elasticity, Finite and Boundary ElementMethods, 1st Edition, Narosa publication, 2007.

1SFCA04: PROF. ELECTIVE 1: (ii) . COMPUTATIONAL EARTHQUAKE ENGINEERING

Course Objectives:

1. Understand the requisites to make a structure earthquake resistant.
2. Understand the provisions given in IS Codes.
3. Design and the perform the earthquake analysis of structures.

Course Outcomes:

Students who successfully complete this course will be able to-

1. Explain the preliminary requisites of designing an earthquake resistant structure.
2. Apply the earthquake resistant design philosophy
3. Analyze seismic behavior of concrete beams for flexure, shear and torsion.
4. Perform earthquake and wind load calculations along with dead load and live loads and their combinations.
5. Analysis and design buildings to resist seismic forces.

SYLLABUS

Units I: Interior of earth, Engineering geology of earthquakes, plate tectonics, Seismicity of the world, tectonic features of India, Faults, Propagation of earthquake waves, Quantification of earthquake (magnitude, energy, intensity of earthquake), Measurements of earthquake (Accelerograph, Accelerogram recording), Determination of magnitude, Epicenter distance, focal depth, etc. Ground motion and their characteristics, Factors affecting ground motions,

Units II: Guidelines for achieving efficient seismic resistant planning, selection of sites, importance of architectural features in earthquake resistant buildings , continuity of construction, Projection & suspended parts, special construction features like separation of adjoining structure, Crumble section, Stair case etc, Twisting of building, seismic effects on structures, inertia forces, horizontal & vertical shaking.

Units III: Non-Engineered structures: Behavior of masonry structure during earthquake, bands & reinforcement in masonry building, openings in wall, importance of flexible structures. Concept of earthquake Resistant design, design philosophy, four virtues of EQRD: Stiffness, Strength, ductility and Configurations, Redundancy & Over strength, Damping, Supplemental Damping, Base Isolation.

Units IV: Review of Limit State Design of RC members. Confinement of concrete, Codal Provisions (IS 1893[I]-2016, IS 13920-2016). Seismic behaviour of concrete, Beams (Flexural, Shear and torsion) Uni-axial and biaxial Beam-column (Axial, shear and moments)

Units V: Building frames, frame-shear wall buildings, Braced Buildings, Preliminary sizing and Mathematical modeling of buildings with different structural systems with and without diaphragms.

Units VI: Earthquake load calculations along with dead load and live loads and their combinations. Special aspects in Multi-storied buildings: Effect of torsion, flexible first story, P-delta effect, effect of soil-structure interaction on building response, drift limitation.

Reference Books:

1. Wakabayshi M.; Design of Earthquake Resistant Buildings, McGraw Hill Books Company; 1986
2. Okamoto, S.; Introduction to Earthquake Engineering; University of Tokyo press; 2nd Edition; 1984
3. Kramer, S.L.; Geotechnical Earthquake Engineering; Prentice Hall; New Jersey; 1996
4. Bolt, B.A.; Earthquakes; W. H. Freeman & Company; NY; 1988
5. AmitaSinhal, Understanding Earthquake Disasters,TataMcraw-Hill Publishing Company Ltd.
6. P. N. Agrawal, Engineering Seismology ,Oxford & IBH Publishing Co Pvt .Ltd
7. PankajAgrawal& Manish Shrikhande, Earthquake Resistant Design of Structures, Prentice Hall India.
8. Duggal S. K., Earthquake Resistant Design of Structures, Oxford University Press 2007
9. Paulay T. and Prestiley M.J.N.; Seismic design of R C & Masonry Buildings; John Willey & Sons; 2nd Edition; 1999.

1SFCA04: PROF. ELECTIVE 1 : (iii) ANALYSIS AND DESIGN OF MACHINE FOUNDATIONS

Course Objectives:

1. To understand fundamental principles of vibrations and dynamics in machine foundations.
2. To learn design techniques for reciprocating, impact, and rotary machine foundations.
3. To gain proficiency in using engineering software (SAP2000, STAAD.Pro, ANSYS) for foundation analysis and design.
4. To understand dynamic soil-structure interaction and its impact on foundation design.
5. To apply Finite Element Analysis (FEA) for dynamic analysis using modern software tools.
6. Todevelop practical design skills through software-based projects and real-world case studies.

Course Outcomes: Students will be able to**-**

1. Analyze the behavior of machine foundations under dynamic loads.
2. Design machine foundations following industry standards.
3. Use engineering software for foundation modeling and analysis.
4. Conduct dynamic analyses for SDOF and MDOF systems.
5. Apply FEA to solve complex foundation design problems.
6. Implement theoretical knowledge in real-world projects.
7. Design foundations to minimize noise and vibration.
8. Engage in research and stay updated on developments in machine foundation design.

SYLLABUS

Unit I: Introduction to Machine Foundations:
Basics of vibrations, free and forced vibrations, damped vibrations, natural frequency, resonance, types of machine foundations, reciprocating machines, impact machines, rotary machines, dynamic soil-structure interaction, soil properties, dynamic response, dynamic stiffness, damping.

Unit II: Vibratory Analysis of Foundations: Single degree of freedom (SDOF) systems, modeling of foundations, equations of motion, harmonic loading, damping mechanisms, viscous damping, hysteretic damping, multi-degree of freedom (MDOF) systems, modal analysis, natural modes, frequencies, coupled systems, uncoupled systems, hands-on practice with software tools.

Unit III: Design of Foundations for Reciprocating Machines:
Dynamic analysis, vibration isolation techniques, mathematical modeling, dynamic forces, dynamic moments, design criteria, vibration limits, amplitude, frequency, foundation design principles, compressors, pumps, engines, codal provisions, guidelines, hands-on practice with software tools.

Unit IV: Design of Foundations for Impact Machines:
Dynamic analysis of impact loads, impact load characteristics, magnitude, duration, frequency, mathematical modeling of impact machines, hammer foundations, press foundations, forging machine foundations, foundation response, transient response, steady-state response, vibration minimization, damping, isolation techniques, hands-on practice with software tools.

Unit V: Rotary Machine Foundations:
Rotating machinery dynamics, centrifugal forces, unbalanced loads, mathematical modeling of rotating machinery, resonance, critical speeds, mode shapes, foundation design for turbines, generators, fans, vibration control methods, balancing, isolation, practical considerations, foundation size, shape, material selection, hands-on practice with software tools.

Unit VI: Advanced Topics in Machine Foundation Design:
Finite element analysis (FEA), dynamic analysis using FEA, FEA software modeling, case studies, noise control, vibration control, noise and vibration sources, reduction techniques, environmental considerations, regulations, case studies on foundation failures, retrofitting techniques, research trends, developments in machine foundation design, hands-on practice with software tools.

References Books:

1. Cheng, Y. M., Law, C. W., & Liu, L. (2021). Analysis, design and construction of foundations. CRC Press.
2. Reese, L. C., Isenhower, W. M., & Wang, S. T. (2005). Analysis and design of shallow and deep foundations (Vol. 10). John Wiley & Sons.
3. Kaynia, A. M. (Ed.). (2021). Analysis of pile foundations subject to static and dynamic loading. CRC Press.
4. Bhokare, M. P. S., Tech, M., & ME, M. S. K. B. (2012). Foundations For Industrial Machines And Earthquake Effect. Foundations, 2(5), 941-954.
5. Bu, S. (1994). Dynamic boundary element analysis of machine foundations. University of Glasgow (United Kingdom).

1SFCA04: PROF. ELECT. 1: (iv) ADVANCE DESIGN OF PRESTRESSED CONCRETE STRUCTURES

Course Objectives:

1. Understand and Explain the behavior of various Prestressed structures.
2. Analyze & Design of Prestressed concrete components.

Course Outcomes: Students who successfully complete this course will be able to**:**

1. Explain the general behavior of PC sections under external load.
2. Explain behavior of Prestressed concrete members and Losses in Prestress steel.
3. Analyze & Design of Prestressed concrete flexural members.
4. Analyze & Design of Prestressed concrete for shear
5. Analyze & Design of Prestressed concrete Water Tank.

SYLLABUS

Unit I: Introduction: Basic concepts – Advantages – Materials required – Systems and methods of Prestressing, Losses of prestress, Analysis for pre-stress Section, Load balancing, Effect of tendon profile, Factors influencing deflections, Partial Prestressing – Definition, methods of achieving partial Prestressing, merits and demerits of partial Prestressing, Grouting of beams, fire resistance of beams.

Unit II: Introduction to Limit state method (Collapse and Serviceability), bending, shear, Deflection(Short-term and Long-term), Cracking (Type I, II, III Members), Permissible stresses in steel and concrete as per I.S.1343-2012 Code, Anchorage zone stresses in post-tensioned beams by I.S.1343-2012 code.

Unit III: Comprehensive design of a rectangular and/or a T-section by limit state method.Comprehensive design of post-tensioned girders.

Unit IV: 1. Analysis and design of end block, anchorage zone reinforcement, Check for transfer bond length in pre-tensioned beams.Analysis and design of Poles.

Unit V: Analysis and design of Piles.Analysis and design of Sleepers.Analysis and design of pipes

Unit VI: 1. Design and analysis of pre-stressed concrete circular tank.Analysis and design of composite beams.

Reference Books:

1. Krishna Raju, N.; Prestressed Concrete Structures; TMH; Delhi; 1981
2. Lin, T.Y. and Burns, N.H.; Design of Prestressed Concrete Structures; 3rd Edition; John Wiley & Sons; NY; 1981
3. Ashok Jain, R. C. C. Design
4. P. Dayaratnam, Prestressed Concrete Structures, Oxford & IBH
5. Latest relevant BIS codes.

1SFCA04: PROF.ELECTIVE 1: (v). REPAIR, RESTRENGHTHING & REHABILITATION OF STRUCTURES

Course Objectives:

1. Perform the seismic evaluation of structure
2. Understand and Apply the various techniques of repair, strengthen & rehabilitation

Course Outcomes: At the completion of this course, the student shall acquire knowledge and ability-

1. To understand various methods of seismic evaluation
2. To apply techniques for rehabilitation / strengthening of RC, Steel and Masonry structures.

SYLLABUS

Unit I: Introduction: Terminology; Basic principles of seismic evaluation and retrofitting. Qualitative Methods of Seismic Evaluation: Rapid visual screening procedure (RVSP) and simplified evaluation of buildings; Visual inspection method and non-destructive testing (NDT) method.

Unit II: Quantitative Methods of Seismic Evaluation: Performance based method using nonlinear static push-over analysis (NSP) and non linear dynamic method of analysis (NDP); Estimation of seismic capacity (strength and ductility).

Unit III: Local and Global Methods of Seismic Retrofitting of RC Buildings: System completion; Strengthening of existing components; RC, Steel and FRP Jacketing; Addition of new components – frames, shear walls and braced frames; Introduction to supplemental energy dissipation and base isolation.

Unit IV: Local and Global Methods of Seismic Retrofitting of Bridges: Seismic evaluation of components of bridges (foundation, pier, deck, bearings), determination of liquefaction potential, modeling issues, strengthening of components.

Unit V: Re-evaluation of Buildings with Retrofitting Elements: Linear and Non-linear modelling; Modelling of soil and foundations. Seismic Repair and Retrofitting of Earthquake Damaged RC Buildings: Schemes of temporary shuttering damages; Methods of repair and retrofitting.

Unit VI: Seismic Safety of Equipments and Accessories: Retrofitting solutions against sliding and overturning of equipments and accessories. Case Studies in Seismic Retrofitting: Case studies RC and masonry buildings.

Reference Books:

1. Comartin, C. D., Niewiarowski, R. W., &Rojahn, C. (1996). Seismic evaluation and retrofit of concrete buildings ATC-40. Applied Technology Council (ATC).: Report No. SSC, 96-01..
2. Priestley, M. N., Seible, F., &Calvi, G. M. (1996). Seismic design and retrofit of bridges. John Wiley & Sons.
3. Thomas, P., & Priestley, M. J. (1992). Seismic design of reinforced concrete and masonry buildings..
4. Kappos, A., &Penelis, G. G. (2010). Earthquake resistant concrete structures. CRC Press.

5. FEMA 154 Rapid Visual Screening of Buildings for Potential Seismic Hazards, A Handbook,.
6. FEMA273, F. (1996). NEHRP Commentary on the guidelines for the rehabilitation of building. Washington DC: Federal Emergency Management Agency.
7. FEMA-356. (2000). Commentary for the Seismic Rehabilitation of Buildings., Federal Emergency Management Agency, Washington, DC.
8. FEMA-440, A. (2005)., Improvement of nonlinear static seismic analysis procedures. FEMA-440, Redwood City.
9. FEMA, P-695 (2009). Quantification of Building Seismic Performance Factors, Federal Emergency Management Agency.
10. ASCE 41. (2006). Seismic Rehabilitation of Existing Buildings.

1SFCA05: ADVANCED DESIGN OF STEEL STRUCTURES – LAB.

Course Objectives:

1. To design the steel structures with reference to codal, site requirements.

Course Outcomes: On completion of course -

1. The student will design steel structure like bridge, Industrial Shed.

SYLLABUS

Complete Design calculations and Drawings to be developed for the following structures based on syllabus for the relevant theory subject using the computational software application. (Any of the Software that is having high accuracy for analysis and design can be use)

1. Design of a steel bridge
2. Design of an Industrial shed

1SFCA06: CAD AND SOFTWARE APPLICATION IN STRUCTURAL ENGINEERING- LAB.

Course Objectives: To impart knowledge on -

i). To model the 3□D geometric information of the structures.
ii). To understand the basic analytical fundamentals that are used.
iii). To create and manipulate geometric models in a computer program.
iv). To analyze the pin – jointed and rigid jointed frames.
v). To create and design various civil engineering structures.

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

i). Use analysis and design package for designing structural elements and structures
ii). Simulate, model and analyze trusses, steel column beam structure
iii). Simulate, model and analyze RCC beams and columns structure using Software.
iv). Utilize drafting packages for preparing Structural drawing.
v). Simulate, model and analyze other structures like water tank, shear wall, bridge etc using Software

List of Experiments: Total SIX (06) Practical to be conducted:

Experiment-1 (Compulsory)

Hands on Practice on STAAD PRO for learning Skills related to i) Structural Analysis and Design Calculating Shear Force and Bending Moment values for various supports and load types, ii) Co-ordinate Systems, Global Vs Local Model Generation, Creating Nodes & Members Select Menu, iii) Model Editing Tools, Connect Beams Along, Stretch Selected Members, Intersect Selected Members, iv) Merge Selected Members, Renumber, Split Beam, Break Beams at Selected Nodes Creating Models by using Structure Wizard, v) Support Specification- Member Property Specification, Member Offset, Material Specification, vi) Group Specification Loading, creating a Primary Load, Adding Self weight, vii) Loading, Nodal Load, Member Load, Uniform Force and Moment, Concentrated Force and Moment viii) General Guidelines for Design, Concrete Design in STAAD.PRO, Column Design, Beam Design, Slab Design etc

Experiment-2 (Compulsory)

Hands on Practice on ETABS for learning Skills related to i) Basics about the ETABS ii) Introduction to various commands of ETABS and their applications in detail, iii) 2D model, analysis and design for Trusses, Beams and Frames, iv) 3D model and analysis for Steel and RC Buildings, v) Earthquake load application to RC and steel structures along with the design, vi)Members grouping, vii) Design Grouping in Steel structures, vii) Application of different building codes in the design of concrete and steel structures.

(Any Four practical from below list)

Experiment-3: Structural Analysis and design of a multi-storeyed RCC building subjected to DL and LL
Experiment-4: Structural Analysis and design of a multi-storeyed RCC building subjected to DL, LL & WL
Experiment-5: Structural Analysis and design of 2D Steel Roof trusses including WL calculation in Excel Spreadsheet
Experiment-6: Structural Analysis and design of 3D Steel Roof trusses including WL calculation in Excel Spreadsheet
Experiment-7: Structural Analysis of Continuous Beams using for different types of loadings and support conditions.
Experiment-8: Structural Analysis and Design of water tanks by using plate elements.
Experiment-9: Structural Analysis and Design of Shear wall.
Experiment-10: Structural Analysis of 2D and 3D Rigid and Braced Frames in Steel Structure for different types of loadings, support conditions, section orientations and stiffness variation between columns and beams, Member offsets, End release, Tension only members, Active and Inactive member specifications,
Experiment-11 Structural Analysis and Design of Single / Multi span Steel Bridge Structure.
Experiment-12 Structural Analysis and Design of Tall Structure like Steel Tower, RCC Chimney, Wind Mill Structure, Big Display Hording Structure etc.

1SFCA07: STRUCTURAL DEIGN, DETAILING, CHECKING & NDT- LAB

Course Objectives:
1. Understand the use of tools for conducting an experiments for checking the strength of existing structure , proof checking of structural design.

Course Outcomes (COs):
At the end of the course, students will be able to:
1. Apply appropriate tools to design and conduct experiments.
2. Select and apply appropriate numerical techniques
3. Function as team member for laboratory work
4. Conduct Non-Destructive Tests on existing concrete structures.
5. Structural weighing of design and drawings

SYLLABUS
Minimum of Three practicals (3) from below (C- compulsory) shall be conducted:

A) Analysis and Design of steel structures
1. Analysis of plane frame for lateral loading
2. Analysis of plane frame using different types of bracing systems

B) Analysis and Design of RCC structures with reinforcement detailing.
1. Analysis of RCC building
2. Analysis of building for lateral loading using shear walls

C) Non-Destructive Tests (Compulsory)
1. Study of Rebound Hammer test on concrete
2. Ultrasonic Pulse Velocity test on Concrete
3. Study of half-cell Potentiometer and measurement of corrosion in RCC.
4. Core removal from concrete structure and compression testing
5. Carbonation Test on concrete

D) Preparation of EXCEL sheets for structural design of beams, portals, slabs and footing.

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SEMESTER-II

2SFCA01: FINITE ELEMENT METHODS

Course Objectives: The objectives of this course are to -
1) Understand the purposes and uses of the finite element analysis process in industry and the possible roles of the structural engineering technologist in that process
2) Learn basic aspects of finite element technology, including domain discretization, polynomial interpolation, application of boundary conditions, assembly of global arrays, and solution of the resulting algebraic systems.
3) Enable the students to perform engineering simulations using commercially available Finite element analysis programs and software's.

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

1) Derive shape function for 1D, 2D,3D elements
2) Derive element matrix equation by different methods by applying basic laws
3) Solve different one Dimensional structural engineering problems using FEM.
4) Solve different Two Dimensional structural engineering problems using FEM.
5) Use professional-level finite element software to solve engineering problems in Solid mechanics
6) Develop and exercise critical thinking in interpreting results from FEM analysis.

SECTION A

Unit I: Introduction and 1D FEM:

Introduction, Basic Concepts of Finite Element Analysis, advantages, disadvantages, Introduction to Elasticity, Steps in Finite Element Analysis, Minimum potential energy theorem, Relation to Rayleigh- Ritz method Interpolation, shape functions, one dimensional Lagrangian and first order Hermitian functions, Natural or local coordinate, Stiffness Matrix and Boundary Conditions

Unit II: 2D FEM:

Two dimensional shape functions, Lagrangian and Serendipity shapes, Area and volume coordinates. Two dimensional plane stress and plane strain analysis, Constant strain triangle, Linear strain triangle, rectangle, Isoparametric elements, Nodal load matrix due to body forces, Stiffness Matrix and Boundary Conditions, Gauss integration, locations and weightages of Gauss points.

Unit III: Analysis of Frame Structures:

Stiffness of Truss Members, Analysis of Truss, Stiffness of Beam Members, Finite Element Analysis of Continuous Beam, Plane Frame Analysis

SECTION B

Unit IV: 3D FEM:

Axisymmetric Element, Finite Element Formulation of Axisymmetric Element for analysis of axisymmetric solids subjected to axisymmetric loads only, Finite Element Formulation for 3 Dimensional Elements using eight and twenty noded isoparametric hexahedron, four noded tetrahedron.

Unit VI: Plates and Shells:

Introduction to Plate Bending Problems, Finite Element Analysis of Thin Plate (12DOF ACM element, 16DOF Bogner Fox element), Finite Element Analysis of Thick Plate, Finite Element Analysis of Shell

Unit VI: Computer Implementation:

Computer Implementation of FEM procedure, Pre-Processing, Solution, Post Processing, Use of Commercial FEA Software.

Reference Books:

1. C.S.Krishnamoorthy, Finite Element Analysis, Theory and Programming., Tata McGraw Hills 1994
1. R. D. Cook, Concept and application of finite element analysis, John Willey and Sons.
2. Bathe and Wilson, Numerical Methods of Structural analysis
3. E.Hinton and D.R.J. Owen, Finite Element programming, Academic press
4. A.D. Belegunda andT.R.Chandrupatla, Finite element method in engineering, pretile Hall.

2SFCA02: EARTQUAKE AND WIND RESISTANT DESIGN

Course Objectives:

1. To impart knowledge on the seismology
2. To impart knowledge of behavior of buildings during earthquakes.

Course Outcomes: On completion of this course,

1. the Student will understand basic terminologies of earthquake.
2. the student will be able to Design various wind resisting structures.

SYLLABUS

Unit I- Interior of earth, Engineering geology of earthquakes, plate tectonics, Seismicity of the world, tectonic features of India, Faults, Propagation of earthquake waves.Review of Limit State Design of RC members. Confinement of concrete.

Unit II- Philosophy of earthquake resistant design, Ductility, Redundancy & Over strength, Damping, Supplemental Damping, Base Isolation, Codal Provisions. Beams (Flexural, Shear and torsion)

Unit III- Uni-axial and biaxial Beam-column (Axial, shear and moments)

Unit IV- Building frames, frame-shear wall buildings, Braced Buildings, Preliminary sizing and modeling of buildings with different structural systems with and without diaphragms,

Unit V- Earthquake, wind load calculations along with dead load and live loads and their combinations.
Unit VI Analysis and design of a Multi-storied RCC frame structure subjected to Wind forces as per Codal provisions .

Reference Books:

1. Paulay T. and Prestiley M.J.N.; Seismic design of R C & Masonry Buildings; John Willey & Sons; 2nd Edn ; 1999
2. Booth, E.; Concrete Structures in Earthquake Regions; Longman Higher Education; 1994
3. Raynolds C.E.; Reinforced Concrete Design Handbook; 9th Edition; Rupa& Company; Calcutta; 1981
4. Raynolds, C.E.; Basic Reinforced Concrete Design; Vol.-II; Conc. Publications Ltd.; 1962
5. Fintel M.; Handbook of Concrete Engineering; 2nd Edition; CBS Publishers, Delhi; 1986
6. Park and Paulay; Reinforced Concrete Structures, John Wiley and Sons.
7. Duggal S. K., Earthquake Resistant Design of Structures, Oxford University Press 2007

2SFCA03: ADVANCE DEIGN OF RCC STRUCTURES

Course Objectives:

1. Analysis and Design of various structural components.

Course Outcomes:

1. Student should get the Knowledge of design of slab and T-beam bridges.
2. A person with broad vision and complete knowledge of analysis and design of elevated service reservoirs.
3. The student will be able to analysis and design of multistoried buildings.
4. The student will be able to analysis and design of special structures i.e. pipes, silos & bunkers.
5. Student should get the Knowledge of design of silos.

SYLLABUS

Unit-I: Analysis and design of slab, type and T-beam bridge, IRC recommendations.

Unit-II: Analysis and design of elevated service reservoirs, IS recommendations for wind and earthquake and ductile detailing.

Unit-III: Analysis and design of multistoried buildings, calculation of loads, approximate analysis, primary sizing, IS:875, 1893 recommendations, ductile detailing.

Unit-IV: Analysis and design of special structures i.e. pipes (underground, on ground and elevated), silos and bunkers IS recommendations.

Unit-V: Design of silos.

Reference Books:

1. Plain and reinforced concrete structures Vol. II: Jain and Jaikrishna.
2. IS 456-2000
3. Design & Construction of Silos & Bunkers: Sargis S. Safarian, Earnest C Harris
4. Advance RCC Design by S.S. Bhavikatti

2SFCA04: PROFESSIONAL ELECTIVE II: (i) THEORY OF PLATES AND SHELLS

Course Objectives:

1. To form the differential equations of plates and shells

Course Outcomes: At the end of the course

1. The students will perform the rigorous calculation of differential equations of plates and shells

SYLLABUS

Unit I: Governing differential equations of thin rectangular Plates with various boundary conditions and loadings.

Unit II: Introduction, Moment of curvature relation in pure bending, metrical bending of circular plates (Lateral loaded, uniformly loaded with clamped).

Unit III: Laterally loaded rectangular plates, Differential equation of the deflection surface (Lagrange's equation), Boundary conditions, simply supported plates under sinusoidal loading, Navier's solution.

Unit IV: Finite differential method, differential equation to bent surface of anisotropic plate, Application to grid.

Unit V: General shell geometry, classifications, stress resultants, equilibrium equation, Membrane theory for family of shells (Parabolic, Quaternary, Cycloid, Circular, hyperbolic).

Unit VI: Classical bending theories of cylindrical shells with and without edge beams, FinsterWalder Theory, Schorer's Theory Approximate analysis & design of cylindrical shells.

Reference Books:

1. Timoshenko, S. P. &Kriegar, W.; Theory of Plates & Shells; McGraw Hill; NY; 1970
2. Szilard, R.; Theory and Analysis of Plates; Prentice Hall; 1974
3. Novozhilov, V.V.; Thin Shells; Noordho of Groningen; 1964
4. Ramaswamy G. S., Design of Concrete Shells; Krieger Publication Co.; 1984
5. Chandrasekhar K.; Theory of Plates; University Press India Ltd.; Hyderabad; 1st Edition; 2001

2SFCA04: PROFESSIONAL ELECTIVE II: (ii) SUBSTRUCTURES AND FOUNDATION DESIGN

Course Objectives:

1. Design of Foundation for various conditions
2. Analysis of different situations at base of structure.

Course Outcomes: At the completion of this course, the student shall acquire knowledge and ability,

1. To select and design appropriate foundations based on various criteria,
2. To check the stability of various components of foundations and retaining walls.

SYLLABUS

Unit I: Introduction geotechnical aspects for foundation design (Bearing capacity, modulus of subgrade reactions etc.) and relevant IS codes

Unit II: Analysis and design of shallow foundations: Individual and combined footings for axial and bending loads (Uniaxial and biaxial), Loss of contacts and calculation of liftoff

Unit III: Analysis and design of raft foundations, Annular Footings, Rigid and flexible foundations, Beams and slabs on elastic foundations

Unit IV: Analysis and design of pile and pile cap

Unit V: Analysis and design of Well foundations

Unit VI: Analysis and design of Retaining walls

Reference Books / Material:

1. Hetényi, M. (1971). Beams on elastic foundation: theory with applications in the fields of civil and mechanical engineering. University of Michigan.
2. Bowles, J. E. (1988). Foundation analysis and design.
3. Saran, S. (2006). Soil dynamics and machine foundation.
4. Srinivasulu, P., &Vaidyanathan, C. V. (1976). Handbook of machine foundations. Tata McGraw- Hill Education.
5. Kurian, N. P. (1982). Modern foundations: introduction to advanced techniques. Tata McGraw-Hill.
6. Reese, L. C., Isenhower, W. M., & Wang, S. T. (2006). Analysis and design of shallow and deep foundations (Vol. 10). Hoboken, NJ: Wiley.

2SFCA04: PROFESSIONAL ELECTIVE II: (iii) DESIGN AND DETAILING OF FORMWORK

Course Objectives:

1. To comprehend the basic principles and requirements of formwork design.
2. To learn about different types of formwork systems and their applications.
3. To explore materials used in formwork construction and their properties.
4. To analyze loads and stresses on formwork structures.
5. To develop skills in designing formwork systems for various construction scenarios.
6. To understand safety considerations and best practices in formwork design and installation.

Course Outcomes: At the end:

1. Student will apply principles and terminologies in design of formwork.
2. Student will identify the suitable material to make a formwork.

SYLLABUS

UNIT I: Introduction to Formwork: Definition and significance, Historical development, Importance in modern construction practices. Basic Principles of Formwork Design: Structural requirements, Functional requirements, Economical considerations. Types of Formwork Systems: Traditional timber formwork, engineered formwork systems (steel, aluminum, composite), Modular formwork systems, Climbing formwork, Slip form systems

UNIT II: Advancement & Scope of formwork: Advance formwork Technologies available in market. Formwork material used as a formwork.Formwork Field as a Career option.
Formwork Materials and Components: Common materials used in formwork construction (wood, steel, aluminum, etc.), Formwork accessories: ties, wedges, braces, etc., Selection criteria for formwork materials and components.

UNIT III: Structural Analysis for Formwork: Loads on formwork: dead load, live load, lateral pressure, etc., Principles of structural analysis for formwork systems, Calculation of formwork pressures and loads.
Formwork Failures: Causes and Case studies in Formwork Failure, Formwork Issues in Multi-Story Building Construction

UNIT IV: Formwork Design: Formwork Design Considerations: Formwork planning and layout, Factors influencing formwork design: geometry, concrete properties, construction sequence, etc. Shuttering design for different structural elements: slabs, beams, columns, walls, etc. Formwork Systems and Design for Foundations, Walls, Columns, Slab and Beams.

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

UNIT VI: Safety in Formwork Design: Hazards associated with formwork construction, Safety regulations and guidelines, Design considerations for ensuring formwork stability and worker safety Industry Standards and Best Practices: Overview of relevant industry standards (ACI, BS, Euro codes, etc.), Best practices in formwork design and construction, Case studies and examples of successful formwork projects.

Reference Books:

1. Robert L. Peurifoy and Garold D. Oberlender, “Formwork for Concrete Structures”, McGraw- Hill, 2006.
2. Hurd. M.K., “Formwork for Concrete”, Special Publication, 5th Edition American Concrete Institute, Detroit, 2003.
3. Austin. C.K., “Formwork for Concrete”, Cleaver- Hume Press ltd., London 2006.
4. Tudor Dinescu and ConstantinRadulescu, “Slip Form Techniques”, Abacus Press Tum Bridge Wells, Kent, 2002.
5. Indian Concrete Institute, “Technical Monograph for Formwork”, 2002. P. Chandra, Projects: Planning, analysis, selection, financing, implementation, and review, Tata McGraw-Hill, New Delhi, 2009.
6. IS 14687: 1999, false work for Concrete Structures Guidelines, BIS.
7. Formwork for Concrete Structures, Peurify, McGraw Hill India, 2015.
8. Formwork for Concrete Structures, Kumar NeerajJha, Tata McGraw Hill Education, 2012.

2SFCA04: PROFESSIONAL ELECTIVE II: (iv) COMPUTATION DESIGN OF CIVIL STRUCTURE

Course Objectives:

1. Understand the requisites to perform structural analysis.
2. Apply the gained knowledge to perform computer based analysis.

Course Outcomes (COs): At the end of the course the students will be able to:

1. Comprehend fundamentals of computer-based analysis.
2. Perform advanced structural analysis using stiffness method.
3. Develops computer programs for analysis and design of structural elements using C++/MATLAB and Spreadsheet.
4. Comprehend concepts of seismic design and perform linear and non-linear seismic analysis of RC buildings.
5. Perform integrated analysis and design of RC building structures using structural analysis software(s) and comprehend concepts of seismic design.

SYLLABUS

Unit I: Computer based Structural Analysis: Fundamentals Purpose and Types of Analysis – Kinematic and Static determinacy – Determinacy of Plane Trusses – Pure Beams and Plane frames – Introduction to stiffness and flexibility methods of analysis

Unit II: Stiffness Method for Linear Elastic Analysis: Analysis of plane and space trusses – Pure beams – Plane and space frames and grids using stiffness Method

Unit III: Introduction to Computational tools for Structural Engineer: Spreadsheet tool for engineers - Programming with Excel/VBA Developing spreadsheet for design of structural elements. Introduction to Computer: Programming in Structural Engineering using C++/MATLAB

Unit IV: Introduction to Seismic Analysis and Design Approaches: Concepts of linear and non-linear analysis procedures – Fundamentals of nonlinear static pushover analysis– Introduction to Direct Displacement Based Seismic design for RC buildings and concept of Performance Based Seismic Design of RC buildings.

Unit V: Computer assisted Structural Analysis and Modelling: Modelling of structural elements like truss – beam – frame and grid using Structural design software – Developing structural models using graphical user interphase (GUI) –

Unit VI: Understanding pre-processing and post processing phases for solving analysis problem – Solution errors and Model correctness – Analysis of building frames for gravity and lateral loading.

References:

1. Balfour, J A D, “Computer Analysis of Structural Frameworks”, 2nd edition, Blackwell Scientific Publication, Oxford, UK,1992.
2. Johnson, David, “Linear Analysis of Skeletal Structures”, Thomas Telford, London, UK,2004.
3. Paz, M and Leigh, W “Integrated matrix Analysis of structures: Theory and Computation”, Kluwer Academic Publishers, Boston, USA,2001.
4. Hoit, Mark, “Computer Assisted Structural Analysis and Modelling”, Prentice Hall, Inc., NJ, USA,1995.
5. Christy, craig T.,” Engineering with Spreadsheet: Structural Engineering Templates using Excel”, ASCE Press,2006.
6. S R Davis, “Spreadsheets in Structural Design”, Longman, 1995
7. Gilat and Subramaniam, “Numerical Methods for Engineering and Scientists: An Introduction to applications Using MATLAB”, Wiley 2018.
8. CirulisMikus and Wicks Phil, “Structural Analysis”, Thomas Telfor Limited, 2015.

2SFCA04: PROFESSIONAL ELECTIVE II: (v) COMPUTER AIDED NUMERICAL METHODS

Course Objectives:

1. Understand the numerical techniques for engineering problems.
2. develop codes/software for solution using numerical techniques.

Course Outcomes: At the completion of this course, the student shall acquire knowledge and ability-

1. To understand various numerical techniques for solving problems in structural engineering.
2. To develop codes/software for solution using numerical techniques.

SYLLABUS

Unit I: Computer programming Fortran /C/MATLAB–Programming fundamentals, Introduction to algorithm development, Computer Implementation of Matrices, Guidelines for development of a large sized problem.

Unit II: Numerical methods-Solution of Linear Simultaneous equations – Method of Gauss Elimination, Cholesky''s, Jacobi iteration, Gauss – Seidel method of Iteration,

Unit III: Numerical Integration – Trapezoidal, Simpson's and other Newton – Cotes formulae, Method of Gauss Quadrature.

Unit IV: Interpolation (Lagrange Interpolation, Taylor series expansion, Extrapolation), curve fitting.

Unit V: Regression Initial and boundary value problem, Euler's, Runge-kutta, Milne's etc, Computer oriented Algorithms.

Unit V: Solution of nonlinear Equations. Eigen value and Eigen vectors. Problems associated with choice and implementation of solution techniques in the eigen solution of large problems arising in dynamic systems.

Reference Books/Material:

1. Scarborough J. B., "Numerical Mathematical Analysis", Oxford and IBH publishers, 1966.
2. Gerald C. F., "Applied Numerical Analysis", Addison – Wesley Publishing Company, 1970.
3. Jain M. K., Iyengar S. R. K. and Jain R. K, "Numerical Methods for Scientific and Engineering Computations", John Wiley – New Age International Limited, 1993.
4. Balgurusamy E., "Numerical Methods", Tata McGraw Hill, New Delhi, Fifth Edition, 2001.
5. Rajaraman, V., "Fortran-95", Prentice Hall of India, 1988.
6. McCormic J. M. and Salvadori M. G., "Numerical Methods in FORTRAN", Prentice Hall of India, New Delhi, 1966.
7. Press, W.H; Tenkolsky, S.A.; Vetterling, W.T.; & Flannery, B.P., "Numerical Recipes-the art of scientific Computing; 2nd Edition", Cambridge University Press, 1993.
8. Kanetkar Y. P., "Let us C", BPB Publication, New Delhi.
9. Bathe, K. J., "Finite Element Procedures", Springer, 2nd Edition, 2002
10. JaanKiusalaas, "Numerical method in engineering with Matlab" Cambridge University Press, 2010.

2SFCA05: FINITE ELEMENT ANALYSIS STUDIO-LAB.

Course Objectives:

1. Understand the concepts of Finite Element.

Course Outcomes: At the completion of this course, the student shall acquire knowledge and ability-
To perform analysis by using finite element techniques.

List of Experiments:

From the list below **minimum 6** experiments shall be conducted:

1. Analysis and design of a multi-storeyed building subjected to DL, LL and EQ using equivalent static method
2. Analysis and design of a multi-storeyed building subjected to DL, LL and EQ using Response spectrum method
3. Analysis and design of a multi-storeyed building subjected to DL, LL and EQ using Time history analysis
4. Analyze of a structure using pushover analysis
5. Analysis and design of a Highrise Multi storey Building with shear wall
6. Analysis and design of a Highrise Multi storey Building with Flat Slab System
7. Analysis and Design of a PEB Structure
8. Analysis and design of raft foundation

2SFCA06: ADVANCE DESIGN OF RCC STRUCTURES - LAB.

Course Objectives:

1. Understand the advance design procedures for RCC Structures.

Course Outcomes: At the completion of this course-

1. The student will perform the design procedures for RCC structures using advance methods.

List of Experiments:

From the list below **minimum 5** experiments shall be conducted:

1. Design of Square/ Rectangular Bunker.
2. Design of Circular Bunker.
3. Design of silos for storing of cement.
4. Design of Transmission tower.
5. Design of Intz Type overhead water tank.
6. Design of Conical Type overhead water tank.
7. Design of Box Culvert.
8. Design of slab Deck Bridge.
9. Design of T-Beam Bridge.
10. Design of Gantry girder.
11. Design and detailed drawing of complete G+ 3 structures.

2SFCA07: MINI PROJECT & SEMINAR

Mini Project & Seminar - Mini Project report is to be submitted individually by student in Spiral Binding copy to department on any one of the following topics:

1) RCC design of G +2 storey frame structure with detailed drawing
2) Steel Design of Industrial Shed / Foot bridge with detailed drawing
3) Design & detailed drawing Comparison with live structural project

SEMESTER-III

3SFCA01 OPEN ELECTIVE: (i) INDUSTRIAL SAFETY

Course Objectives: Student will be able -
1. To learn Industrial Safety, its Principal and Management
2. To learn planning for safety and role of communication in safety
3. To learn standards and procedures for effective implementation of safety
4. To learn the good practices for industrial safety; Plant, Workstations& Machinery
5. To learn safe practices for manual and machine material handling
6. To learn industrial safety standards and procedure for accident prevention

Course Outcomes:
After successful completion of this course, the student-
1. has learnt and understand significance of safety management
2. has learnt safety planning and role of communication in its implementation
3. has learnt standards and procedures for effective implementation of safety
4. has learnt good practices for industrial safety; Plant, Workstations& Machinery
5. has understood concepts of safety in machine guarding, use of tools, material handling and storage.
6. has learnt principles, practices of accident prevention.

SYLLABUS

Unit-I: Industrial Safety: History of Safety. Movement in India and abroad. Need for safety, legal, humanitarian, economic and social considerations.
Safety Principles:General principles of Management. Authority, responsibility & power of management.Span of Control.Delegation and decentralization of authority.
Safety Management: Concept, definition, nature and importance. Role and functions of Manager.Elements and functions of Management. Training Programmes: Types of training programmes. Seminars, Conferences,workshop, etc.

Unit-II: Planning for Safety: Definition, purpose, nature, scope and procedures, etc.Strategic planning and process of implementation.Management by objectives and its role in safety.Policy formulation and effective planning for safety.
Communication: Fundamentals, importance, process, types & channels. Essential rules for communication.Two-way communication.Barriers and break-downs in communication.Communication with management, employees & union. Communication and group-dynamics.

Unit III: Safety Standards: Total Quality Management and its application to SHE, ISO standard for management systems of Occupational Health & Safety ISO 45001:2018. National Policy on Safety, Health and Environment at Work Place. Indian Standards for construction operation, National Building Code.

Unit IV: Plant Layout and design: Types of Plant Layout and design. Elements of consideration. Work station design : Concept of workstation and its design for improving safety and productivity.
Machinery Safety: Statutory provisions related to safeguarding of machinery and working on/near unguarded machinery. Principles of machine guarding.Ergonomics of machine guarding.Type of guards.Design, Selection, maintenance and repair of guards.Incidental safety devices and methods.

Unit V: Manual material handling: Basic principle of correct lifting and handling of materials. Avoidance of excessive muscular effort. Maximum loads that may be carried. Lifting and carrying of objects of different shapes, size and weight. Safe use of accessories for manual handling. Ergonomics of manual handling. Machine Handling: Mechanical handling of material: Safety aspects in design, construction, testing and examination. Safety in operation and maintenance.

Unit VI: Accident Prevention: Accident, Incident, injury, hazard, risk, danger, unsafe acts, unsafe conditions, dangerous occurrences, Type of Accidents, etc.Theories of accident causation; Lost time accident, Disabling injury, Accidents reportable under the factories Act and E.S.I. Act. Frequency rate. Severity rate, Incidence rate, man days lost, etc.Human factors contributing to accidents. H. W. Henrich, Frank bird and Multiple causation theories of accident occurrences. Principles of accident prevention.

Reference Books :

1. Techniques of safety management: Dar. Peterson
2. Industrial Safety and environment: A K Gupta
3. Industrial Safety: Concepts & Practices: K T Kulkarni
4. A course of Industrial Safety : K U Mistry
5. H. W. Henrich - Industrial Accident prevention & Engineering McGraw Hill
6. Accident Prevention Manual for Industrial Operation : National Safety Council 444, North Michigan Avenue, Chicago.
7. Industrial Accident prevention: H E Heinrich, Dan Peterson, Nester Roos
8. Accident Prevention Manual for industrial operations (ISBN: 978-08-7-912024-5)
9. Factories Act 1948.

3SFCA01 OPEN ELECTIVE: (2) PROJECT MANAGEMENT & OPERATIONAL RESEARCH

Course Objectives:

1. To achieve the time management in completion of project work.
2. To perform research work in various disciplines.
3.

Course Outcomes: At the end of course, the student ,

1. The student will acquire a knowledge to complete a project in time
2. The students will perform a research work effectively.

SYLLABUS

Unit-I: Introduction to Management Nature and Purpose, systems approach to Management Process, and emergence of management thought, contributions of Fredrick Taylor, Henry Fayol, Evolution of Management Thoughts – Pre-Scientific, Classical, Behavioural and Modern; Scientific Management, Project management: scope and framework, agencies involved, their relationships and scope Need, nature of construction industry , scope and functions of construction management.

Unit-II: Project Planning Planning process , objectives , strategies and policies, making planning effective Plan development process, precedence diagrams with overlapping relationships, network analysis, master network and sub-nets, time scaled networks, Network Analysis – PERT & CPM- Meaning and Objectives – Managerial applications of Network Techniques — Difference between PERT & CPM - Network fundamentals Construction of Network diagram –Fulkerson's rules –Finding of critical path & Estimated Duration – Time estimates in PERT – Steps involved in PERT calculations – (only simple problems)

Unit-III: Operations Research Operations Research: Concept -- Meaning and Definition – Historical Development of OR – characteristics of OR – Scope & Objectives of OR – Phases of OR –Applications of OR – limitations of OR, Decision strategies - decision under certainty - decision under risk - decision under uncertainty - formulation - decision criterion and decision under competitive situation.

Unit-IV: Game Theory Classification of games. Two - person, zero - sum games - formulation of pay off matrix- saddle points -games with pure strategies and mixed strategies - value of the game. Solution to 2 x 2 matrix, 2 x n matrix, m x 2 matrix and m x n pay-off matrix. Graphical method, algebraic method, linear programming methods. Guidelines to modelling an OR project.

Unit-V: Linear programming problem – Meaning & Objective of LP – Applications of LP – Formulation of Mathematical Model to a LPP – Objective function – Constraints – Solution to LPP (Graphical solution only) – Advantages & Disadvantages of LP, Structure of Transportation problem – IBFS using North West Corner Method (NWCM) – Least Cost Method (LCM) – Vogel's Approximation method (VAM), unbalanced TP, Degeneracy in TP- concept (Simple problems only).

Unit-VI : Assignment Problem & Queuing Theory Mathematical model – Balanced AP – Hungarian Method – Managerial Application of AP – Queuing Theory – Introduction – elementary Queuing system – Operating Characteristics of Queues – Notation – single Channel Queuing Model (with Poisson Arrivals and Exponential Service time) (Simple problems) – length of the queue and system, Waiting time of the queue and system.

Reference Books:

1. Sridhar Bhat. K, Operations Research, Himalaya Publishing House, 2012
2. Sharma. J. K ,Operations Research Theory and Applications , Laxmi Publications, 5th Ed, 2013
3. Hamdy A.T, Operations Research: An Introduction, Pearson,2010.
4. Hiller, F.S. and Lieberman, G.J., Introduction to Operations Research (9th ed.), McGrawHill, 2009
5. Koontz, O'Donnel&Weihrich, Management, McGraw Hill
6. Dharwadkar P P, Management in Construction Industry, Oxford & IBH
7. Luthans, Organization Behavior, McGraw Hill
8. King & Hudson, Construction Hazard and Safety Handbook, Butterworths.

3SFCA01 OPEN ELECTIVE: (3) WASTE TO ENERGY

Course Objectives:

1. An understanding about the concept of waste to energy and equipment involved.
2. Understand conceptual design of a Gasifier and its operational aspect.
3. Comprehend theoretical design of a biomass Combustor and its operational aspect.
4. Grasp basic design of a Biogas plant and its operational aspect.

Course Outcomes:

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

1. Implement the concept of waste to energy in Industrial and allied areas.
2. Design a Gasifier and understand operational aspect of a typical Gasifier.
3. Design a biomass Combustor.
4. Understand operational aspect of a biomass Combustor.
5. Design a Biogas plant.
6. Understand the operational aspect of a Biogas plant.

SYLLABUS

Unit I: Introduction to Energy from Waste:

Classification of waste as fuel, Agro-based, Forest residue, Industrial Waste, MSW, Incinerators, gasifier, digester. Status of waste to Energy conversion in India.

Unit II: Biomass Pyrolysis:

Types of Biomass Pyrolysis, Manufacture of Charcoal, Methods, Yields and application, Manufacture of pyrolytic oils and gases, yields and applications.

Unit III: Biomass Gasification:

Types of Biomass Gasifiers, Basic design of selected Biomass Gasifiers. Operational aspect of a typical Biomass gasifier, Gasifier engine arrangement and electrical power, Equilibrium and kinetic consideration in gasifier operation.

Unit IV: Biomass Combustion:

Biomass stoves, Improved chullahs, types, some exotic designs, Fixed bed combustors Types of biomasscombustors, Basic design of selected biomass combustors, and Operational aspect of a typical biomass combustor.

Unit V: Biogas – 1:
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.

Unit VI: Biogas – 2:
Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India

Reference Books:

1. Tchobanoglous(1993)Integrated Solid Waste Management, Mc-Graw Hill.
2. Prabir Basu (2010) Biomass Gasification and Pyrolysis, Academic Press/ Elsevier Inc.
3. Clark and Deswarte (2015) Introduction to Chemicals from Biomass, John Wiley & Sons.
4. Tabatabaei and Ghanavati (2018) Biogas Fundamentals, Process & Operation, Springer.
5. Abbasi,Tauseef andAbbasi (2012) Biogas Energy, Springer.
6. Nijaguna (2002) Biogas Technology, New Age International Publishers.

3SFCA01 OPEN ELECTIVE: (4) COMPOSITE MATERIALS

Course Objectives:

1. To understand the mechanics of composite materials in construction.
2. To analyze the components made of composites.

Course Objectives:

On completion of this course,

1. The students will be able to explain the behavior of composites in structures.
2. The students will be able to use, analyze and design the components using composites.

SYLLABUS

Unit I-Introduction to Composites, Classifying composite materials, commonly used fiber and matrix constituents, Composite Construction.

Unit II-Properties of Unidirectional Long Fiber Composites and Short Fiber Composites.

Unit III- Concepts in solid mechanics – stress strain effect in composite materials.

Unit IV- Angle-ply and cross ply laminates – Static, Dynamic and Stability analysis for Simpler cases of composite plates, Inter laminar stresses.

Unit V- Failure Criterion, Maximum Stress, Maximum Strain, Fracture Mechanics of Composites, Sandwich Construction.

Unit VI -Applications of Composites, Composite Joints, Design with Composites, Review, Environmental Issues.

References:

1. Agarwal. B.D. Broutman. L.J. and Chandrashekara. K. “Analysis and Performance of Fiber Composites”, Fourth Edition, John-Wiley and Sons, 2017.
2. Daniel. I.M, and Ishai. O, “Engineering Mechanics of Composite Materials”, Second Edition, Oxford University Press, 2005.
3. Hyer M.W., and White S.R., “Stress Analysis of Fiber-Reinforced Composite Materials”, D.Estech Publications Inc., 2009.
4. Jones R.M., “Mechanics of Composite Materials”, Taylor and Francis Group 1999.
5. Mukhopadhyay.M, “Mechanics of Composite Materials and Structures”, Universities Press, India, 2005.

3SFCA01 OPEN ELECTIVE: (5) DISASTER MITIGATION ENGINEERING STRUCTURES

Course Objectives:

1. To understand the fundamental of earthquake, fire resistant structural design.
2. To understand the behavior of structure under fire and blast load.
3. To gain the knowledge about different disaster vulnerability of special structures.
4. To gain the knowledge about different retrofitting techniques for structures and different code of practices

Course Outcomes: At the end of the course, the student-

1. will understand the fundamental of earthquake.
2. will understand the behavior of structure.
3. will gain the knowledge about different disaster vulnerability of special structures.
4. will gain the knowledge about different retrofitting techniques for structures and different code of practices.

SYLLABUS

Unit I: A basic design consideration for multistoried RC and steel structure with foundation as per latest IS: 1893, Capacity based design of building, Types of ductility, Factors affecting ductility, Ductile detailing as per latest IS: 13920, Seismic design considerations for masonry buildings

Unit II: Earthquake effects on the structures, Classification of loads, Seismic methods of analysis, Seismic design Methods, Seismic damages during past earthquakes and effect of irregularities and building architecture on the performance of structures , Sources of weakness in RC and Steel framed buildings, Classification of retrofitting techniques, Conventional and non-conventional methods, IS code provisions for retrofitting of masonry structures.

Unit III: Fire safety of buildings, Effect of high temperatures on different types of steel and concrete structural members, Fire resistance by structural detailing, Analytical determination of the ultimate bending moment, Design of RC members for fire resistance, Introduction of IS: 1642

Unit IV: General characteristics of blast and effects on structures, Blast load on above and below ground structures, Response of structural elements to blast force, Dynamic strength of materials and design stresses, Load combinations for design, Introduction of IS:4991.

Unit V: Performance of special structures during past disaster, Vulnerability of special structures, Health monitoring, Operations and maintenance, Potential threats and risk assessments, National and international policies, Environmental impact due to damage of special structures, Case study, Emergency plan and risk reduction, Post-Disaster recovery and reconstruction.

Unit VI: Introduction to Special Structures and Their Uses: Bridges, Dams, Nuclear power plants, Thermal power plants. Underground Structures: Tunnels, Subways and Storage Tanks, Pipelines, Railways, Roads, Retaining structures, Liquid storage tanks, Waterways, Reservoirs, Wastewater infrastructure and offshore structures.

Reference Books:

1. Thomas Paulay and Priestley M. J. N., “Seismic Design of Reinforced Concrete and Masonry Buildings”, Wiley India Pvt Ltd
2. Varghese P. C., “Advanced Reinforced Concrete Design”, 2nd Edition, PHI Learning Pvt. Ltd
3. Cormie David, Mays Geoff and Smith Peter, “Blast Effects on Buildings”, 3rd Edition, Thomas Telford Publishing.
4. Agarwal Pankaj and Shrikhande Manish, “Earthquake Resistant Design of Structures”, PHI

1SFCA08/ 3SFCA02: Audit Course (1) ENGLISH FOR RESEARCH PAPER WRITING

Course Objectives:

1. To understand the use of English Vocabulary and Grammar.
2. To write research paper/ chapters.

Course Outcomes: At the end of the Course, the student-

1. will acquire knowledge of English words and grammar.
2. will write the technical chapters/ papers effectively.

SYLLABUS

Unit I- Planning and preparation, word order & breaking up long sentences, structuring sentences and paragraphs.

Unit II- Being concise, avoiding redundancy, ambiguity and vagueness, literature survey.

Unit III- Highlighting your findings, hedging, paraphrasing and plagiarism.

Unit IV- Sections of a paper – abstract, introduction, etc. review of the literature, writing - methods, results, discussion, conclusions and final check.

Unit V -Writing – Title, Abstract and Introduction, Review of Literature and Methods.

Unit VI- Useful phrases and punctuation, in-text citation and bibliography – MLA/APA styles

Suggested Books:

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

1SFCA08/ 3SFCA02: Audit Course (2) DISASTER MANAGEMENT

Course Objectives:

1. Student should learn about the term Disaster and definitions associated with it.
2. Student should know various types, reasons for happening and preventive measures for Natural Disasters.
3. Student should know various types, reasons for happening and preventive measures for Artificial Disasters.
4. Student should know about Impact and mitigation measures against disasters.
5. Student should know about Disaster Risk Reduction and its utility practices.
6. Learner should know about various Government and NG organization working for Disaster Management.
7. Student should know role and responsibility of individual and group for managing Disaster.

Course outcomes:

At the end of the subject the students will be able –

1. To understand concept and terms related to Disaster.
2. To understand various types of Natural and Artificial Disaster.
3. To decide and take actions to mitigate impact of disaster.
4. To know roles and responsibility of organizations – public and private, individual and group to manage disaster.

SYLLABUS

Unit I: Introduction to Disasters:

Understanding of Hazard, Vulnerability & Disasters.Concept of Risks, Evaluation of Risks. Climate change Risk (IPCC Report): Natural & man-made factors. Driving forces of Vulnerability of cities. Land forms developing forces: Endo-genetic & Exo-genetic. Concept of on-site Disasters.

Unit II: Natural Disasters:

Classification of Disasters.(Natural & man-made). Natural Disasters: Climatic Disasters (wind & water related): Tropical Cyclone, Floods & Drought. Earth related Disasters (Geological Disaster): Earthquake, Tsunami, and Landslides & Volcano Eruption.

Unit III: Manmade Disasters: Man-made Disasters: Industrial (on-site) Disasters: Toxic Gas leak, Explosion, Nuclear & chemical Disaster (BLEVE) Technological Disasters (Accidental Disasters): Rail, Road, Air &Sea. Ecological Disasters: Pollution, Soil Degradation, Loss of Biodiversity & Global warming. Epidemics: Cholera, Typhoid .Biological Disasters: COVID-19

Unit IV: Disaster Management: Basic measures for Disaster management**:** Preventive Measures**,** Preparedness Measures (Disaster mapping profile), Predictability, Forecasting &Warning. Response and Relief measures. Recovery & Rehabilitation measures.

Unit – V: Disaster Preparedness and Training:

Disaster Management Bill, 2005.Institutional Framework for Disaster Management.Role of Media in Disaster Management. Basic Safety Measures (Pre and During): Earthquake & Floods.

Unit VI: Mitigation Strategies:

Disaster Mitigation – Emerging Trends in Disaster Management - UN Draft Resolution on Strengthening of Coordination of Humanitarian Emergency Assistance.

References:

1. IPCC, 2001: Impacts Adaptation and Vulnerability, GRID, Aewndal.
2. Natural Hazards, Bryant Edwards (2005), Cambridge University Press, U.K.
3. Space Technology for Disaster management: A Remote Sensing & GIS Perspective, Roy, P.S. (2000), Indian Institute of Remote Sensing (NRSA), Dehradun.
4. Natural Disaster, Sharma, R.K. & Sharma, G. (2005), (ed) APH Publishing Corporation, New Delhi
5. Disaster Management : A disaster Manager's Handbook, Carter, N W. (1992), Asian Development Bank, Manila.

1SFCA08/ 3SFCA02: Audit Course (3) VALUE EDUCATION

Human Values: During the Induction Program, students would get an initial exposure to human values through Universal Human Values. This exposure is to be augmented by this compulsory full semester foundation course.

Course objectives:

1. Development of a holistic perspective based on self-explanation about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection
4. Development of commitment and courage to act.

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

1. Analyze the significance of value inputs provided in formal education along with skills and develop a broader perspective about life and education.
2. Formulate their aspirations and concerns at different levels of living, and the way to fulfill them in a sustainable manner.
3. Evaluate their current state of understanding and living, and model a healthy lifestyle.
4. Examine the issues of home sickness, interactions with seniors on the campus, peer pressure with better understanding and feel grateful towards parents, teachers and others.
5. Develop more confidence and commitment for value-based living in family, society and nature.

Unit I: Course Introduction – Need, basic guidelines, content and process for value education.

1. Purpose and motivation for the course, recapitulation from universal human values-1
2. Self-exploration-what is it? – Its content and process; 'Natural Acceptance' and Experimental Validation – as the process for self- exploration
3. Continuous happiness and prosperity – A look at basic human aspirations
4. Right understanding, relationship and physical facility – the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding happiness and prosperity correctly – A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and coexistence) rather than as arbitrariness in choice based on linking-dislinking.

Unit II: Understanding harmony in the human being – harmony in myself:

1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
2. Understanding the needs of self ('I') and 'Body' – happiness and physical facility
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in 'I'
5. Understanding the harmony of I with the Body; Sanyam and health; correct appraisal of physical needs, meaning of prosperity in detail 6. Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available tome. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

Unit III: Understanding harmony in the family and society-harmony in human-human relationship.

1. Understanding values in human-human relationship; meaning of justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; trust and respect as the foundational values of relationship
2. Understanding the meaning of trust; difference between intention and competence
3. Understanding the meaning of respect, difference between respect and differentiation; the other salient values in relationship
4. Understanding the harmony in the society (society being an extension of family); resolution, prosperity, fearlessness (trust) and co-existence as comprehensive human goals
5. Visualizing a universal harmonious order in society – undivided society, universal order – from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships.Discus with scenarios. Elicit examples from students' lives.

Unit IV: Understanding harmony in the nature and existence – whole existence as coexistence.

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfilment among the four orders of nature - recyclability and self-regulation in nature.
3. Understanding Existence as Co-existence of mutually interacting units in all pervasive space.
4. Holistic perception of harmony at all levels of existence.
5. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Unit V: Implications of the above Holistic Understanding of Harmony on Professional Ethics.

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
5. Case studies of typical holistic technologies, management models and production systems
6. Strategy for transition from the present state to Universal Human Order:
7. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
8. At the level of society: as mutually enriching institutions and organizations
9. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g. To discuss the conduct as an engineer or scientist etc.

Reference Books:

1. J eevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakash an, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - M aulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

1SFCA08/ 3SFCA02: Audit Course (4) CONSITIUTION OF INDIA

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

1. Create awareness about the Constitution of India, Fundamental Rights and Duties, Directive Principles
2. Learn the role of Prime Minister, President and the Council of Ministers and the State Legislature
3. Learn the divisions of executive, legislative and judiciary and so on.
4. Know how a municipal office, panchayat office etc. works
5. Understand the importance and role of Election Commission Function

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

1. Know the importance of Constitution and Government
2. Become Good Citizens and know their fundamental rights, duties and principles.
3. Learn about the role of PM, President, Council of Ministers and Local Administration.
4. Understand the importance of Election Commission.
5. Will know about Secularism, Federalism, Democracy, Liberty, Freedom of Expression, Special Status of States.

Unit I: Introduction 'Constitution' meaning of the term, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Unit II: Union Government and its Administration Structure of the Indian Union: Federalism, Centre - State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha.

Unit III: State Government and its Administration Governor: Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions.

Unit IV: Local Administration District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Panchayati raj: Introduction, PRI: Zila Panchayat, Elected officials and their roles, CEO ZilaPanchayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

Unit V: 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.

Text Books:

1. 'Indian Polity' by Laxmikanth 5th Edition, McGraw HillEdition.
2. Indian Constitution by Subhash C. Kashyap, Vision Books Publisher
3. 'Introduction to Indian Constitution' by D.D. Basu, 21st Edition, LexisNexis Publisher
4. 'Indian Administration by avasthi and avasthi-by Lakshminarain Agarwal publication.

1SFCA08/ 3SFCA02: Audit Course (5) PEDAGOGY STUDIES

Course Objectives:

1. To enable the students to understand the concepts of pedagogy and the improvement of teaching methods.
2. To make the students understand a range of cognitive capacities in human learners.
3. To explain the outcome-based education system.
4. To describe the curriculum design process**.**

Course outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the basics of pedagogy
2. Know the pedagogical practices used by teachers in formal and informal classrooms in developing countries.
3. Realize the effectiveness of pedagogical practices

SYLLABUS

Unit I: Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology -Theories of learning, Curriculum, Conceptual framework, Research questions. -Overview of methodology and Searching. Learning process, motivation and engagement, ICT in learning and teaching, Facilitating the learners, Engineering education and recent trends, Research in Engineering education, General maxims of teaching, Teacher-centered, learner-centered and learning-centered approaches, Becoming a reflective teacher, Disruptive Innovation in Education**.**

Unit-II: Outcome Based Education: A broad context for quality teaching and learning, planning for quality teaching and learning, Necessity for learning outcomes - Course Outcomes and Program Outcomes, defining learning outcomes, learning outcomes in the cognitive domain, learning outcomes in the affective domain, learning outcomes in the psychomotor domain, Program Outcomes, Graduate Attributes, Program Educational Objectives, linking learning outcomes to teaching and assessment.

Unit-III: Curriculum design cycle, curriculum structure, credit and academic load, need assessment –feedback from stakeholders, concept of ―Constructive alignment‖, the two-loop approach of ABET, tuning approach of curriculum design, CDIO concept of curriculum design and implementation, Industry relevant curriculum design and implementation, concept mapping, Instructional design and delivery.

Unit-IV: Direct instruction as teaching strategy, co-operative learning, problem-solving, industry relevant teaching, role-play, case study, technology enabled teaching, research orientation, measurement and evaluation of student's achievement, assessment of learning outcomes - assessment tools: direct and indirect assessment tools, rubrics for assessment, attainment analysis, corrective action- curriculum updating, improvement in pedagogy, innovative assessment methods.

References:

1. Dr.Sue Duchesne, Anne McMaugh, Sandra Bochner, Kerri-Lee Krause, ―Educational Psychology for Learning and Teaching‖, Cengage Learning, 4th Edition, 2019.
2. Lisa R. Lattuca, Patrick T. Terenzini, J. Fredericks Volkwein, and George D. Peterson, ―The Changing Face of Engineering Education‖ The Bridge, National Academy of Engineering, Summer 2006.
3. Anderson, L. &Krathwohl , D. A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives . New York: Longman, 2001.
4. Blumberg, P. Developing learner-centred teaching: A practical guide for faculty. San Francisco: Jossey-Bass, 2017.
5. Teaching Support Services. Learning objectives. University of Guelph, Guelph, ntario. Retrieved from http://www.uoguelph.ca/tss/resources/idres/learningobjectives1.pdf.
6. O.V. Boev, N.Gruenwald and G.Heitmann, ―Engineering Curriculum Design aligned with Accreditation Standards‖, Hochschule Wismar Publishers, 2013.
7. Fink, D. L. Integrated course design. Manhattan, KS: The IDEA Center, 2005. Retrieved from http://www.theideacenter.org/sites/default/files/Idea_Paper_42.pdf.

1SFCA08/ 3SFCA02: Audit Course (6) STRESS MANAGEMENT BY YOGA

Course Objectives:

1. To learn the different styles of yoga and its importance.
2. To manage effectively the stress using Yoga.

Course Outcomes: At the end of the Course, the student,

1. will get the knowledge of Yoga and its type.
2. will explain the use of yoga in reducing stress.

SYLLABUS

UNIT I: Meaning and definition of Yoga, Aims & objectives of yoga, misconception about yoga.Historical perceptive on yoga.Yoga practices and other systems of exercises.Limitation and scope of yoga therapy.

Unit II: Impact of Yoga on Muscular system, Respiratory System, Circulatory system, Nervous system, Digestive system and Endocrine system.

Unit III: Yoga and development of Social qualities of personality – Co-operation –Simplicity – Tolerance – Social adjustments – Yoga and personal efficiency.Improvement of personal efficiency through yoga.

Unit IV: Concept and definitions of health, factors affecting health, Yogic concept of health. Characteristics of healthy person. Types of diseases –infectious, stress related diseases, chronic, viral, genetic.

Unit V: Yogic Lifestyle, Yogic Diet, Yogic concepts of Fasting, Concept of Counseling in Yoga, Aims & Principals of Counseling, Importance of Counseling in Yoga.

Unit VI: Streams of yoga, Dhyan, yoga, karma yoga, Bhakti yoga,Raja yoga, Mantra yoga.

References:

1) Ravishankar.N.S., (2001). Yoga for Health. New Delhi: PustakMahal. Tummers, Nanette, E., (2009) Teaching Yoga for Life. Champaign: Human Kinetics.
2) SampurnaYogVidya : Rajeev Jain, Manjul Publication House Pvt. Ltd, Bhopal
3) Asana, Pranayam, Mudra : Swami Satyanandsaraswati, Yog Publication BhandhaTrust,Munger (Bihar)
4) RogAurYog : Swami SatyanandSarswati, Yog Publication Trust, Munger (Bihar)
5) Yogic Therapy : Swami Kuvalyanand and Dr.VinegerKaivalyadham, Lonavala.

1SFCA08/ 3SFCA02: Audit Course (7) PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

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 Outcomes:

Upon completing this course, students will be able to:

1. Develop their personality and achieve their highest goal of life.
2. Lead the nation and mankind to peace and prosperity.
3. To practice emotional self regulation.
4. Develop a positive approach to work and duties.
5. Develop a versatile personality

SYLLABUS

Unit-I: Neetisatakam – Holistic development of personality - Verses 19, 20, 21, 22 (Wisdom) -Verses 29, 31, 32 (Pride and Heroism) - Verses 26,28,63,65 (Virtue)

Unit-II: Neetisatakam – Holistic development of personality (cont˝d) - Verses 52, 53, 59 (dont˝s) -Verses 71,73,75& 78 (do˝s) - Approach to day to day works and duties.

Unit-III: Introduction to Bhagavad Geetha for Personality Development - ShrimadBhagawadGeeta:Chapter 2 – Verses 41, 47, 48 - Chapter 3 – Verses 13,21,27,35 - Chapter 6 – Verses5,13,17,23,35 - Chapter 18 – Verses 45, 46, 48 Chapter – 6: Verses 5, 13, 17, 23, 35; Chapter– 18: Verses 45, 46, 48

Unit-IV: Statements of basic knowledge – ShrimadBhagawad Geeta: Chapter 2- Verses 56, 62,68 -Chapter 12 – Verses 13, 14, 15, 16, 17, 18 - Personality of Role model from Shrimad BhagawatGeeta.

Unit-V: Role of Bahgavadgeeta in the present scenario - Chapter 2 – Verses 17 – Chapter 3 – Verses36, 37, 42 - Chapter 4 – Verses 18, 38, 39 - Chapter 18 – Verses 37, 38, 63.

Suggested Reading:

1. “Srimad Bhagavad Gita” by Swami Swarupananda Advaita Ashram (PublicationDepartment), Kolkata.
2. Bhartrihari˝s Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit
3. Sansthanam, New Delhi.

Web resource:

1. NTPEL:http://nptel.ac.in/downloads/109104115/

1SFCA08/ 3SFCA02: Audit Course (8) SANSKRIT FOR TECHNICAL KNOWLEDGE

Course Objectives :

1. To learn the technical knowledge available in Sanskrit literature.
2. To awaken wisdom in students regarding ancient literature.

Course Outcomes:

Upon completing this course, students will be able to:

1. Acquire the knowledge of Sanskrit.
2. Understand the technical knowledge available in Sanskrit.

SYLLABUS

Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences, Order,Introduction of roots, Technical information about Sanskrit Literature, Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics.

Suggested reading:

1. “Abhyaspustakam” – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi.
2. “Teach Yourself Sanskrit” PrathamaDeeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication.
3. “India˝s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi.

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