Curriculum and Syllabi For

M.E. (STRUCTURAL ENGINEERING)

(Full Time)

2018

Regulations

OFFICE OF THE CONTROLLER OF EXAMINATIONS
GOVERNMENT COLLEGE OF TECHNOLOGY
THADAGAM ROAD, COIMBATORE – 641 013

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Email: gctcoe@gct.ac.in
GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE
DEPARTMENT OF CIVIL ENGINEERING
(Structural Engineering)

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The following Programme Educational Objectives are designed based on the department mission

PEO 1: To impart conceptual knowledge and develop analytical skills to design and build sustainable structural systems with an exposure to real time projects.

PEO 2: To develop research attitude in the field of Structural Engineering covering a wide spectrum of themes.

PEO 3: To excel in the profession with team work and leadership qualities having social responsibility and ethical values.
Students in the Structural Engineering Programme should be at the time of their graduation be in possession of the following:

PO 1: To enhance knowledge in the area of applied science and mathematics with a well balanced preparation in engineering fundamentals and practical applications.

PO 2: To identify, analyze and design complex engineering problems.

PO 3: An ability to design and conduct experiments, as well as to analyze and interpret data.

PO 4: To gain research skills in the various field of structural engineering employing different methodologies and techniques.

PO 5: An ability to use the techniques advanced modern engineering skills, instrumentation and software packages necessary for structural engineering practice.

PO 6: An ability to lead, manage and to be productive in a multi disciplinary team.

PO 7: To execute and manage the multidisciplinary projects with global standards and sustainability.

PO 8: An ability to communicate effectively and to possess excellent report writing, making presentation and documentation.

PO 9: An ability to recognize the need for life-long learning to meet the challenging and demand driven needs of the society with a high level of enthusiasm.

PO 10: To demonstrate knowledge of professional and ethical responsibilities.

PO 11: To develop confidence for self-education through various case studies.
GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE

DEPARTMENT OF CIVIL ENGINEERING
(Structural Engineering)

PROGRAMME SPECIFIC OUTCOMES (POs)

**PSO1:** An ability to obtain Global level research opportunities to pursue Ph.D programme with Institutions of National importance and Specific placements in R & D departments in Structural Engineering domain.

**PSO2:** An ability to apply design, develop and execution of projects including life – line services.

**PSO3:** An ability to become a good entrepreneur and to improve the management skills.

**PSO4:** An ability to face Discipline specific competitive exams that offer challenging and rewarding careers.
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M.E. STRUCTURAL ENGINEERING
CURRICULUM
(Full Time Candidates admitted during 2018-2019 and onwards)
FIRST SEMESTER
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# CURRICULUM DESIGN

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SYLLABI
18SEFCZ1 RESEARCH METHODOLOGY AND IPR
(Common to All Branches)

Category : FC
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PREREQUISITES: Nil

COURSE OBJECTIVES:
Upon completion of this course, the students will be familiar with:
- Definition and objectives of Research
- Quantitative methods for problem solving
- Data description and report writing

UNIT I INTRODUCTION
Definition and objectives of Research – Types of research, Various Steps in Research process, Mathematical tools for analysis, Developing a research question-Choice of a problem Literature review, Surveying, synthesizing, critical analysis, reading materials, reviewing, rethinking, critical evaluation, interpretation, Research Purposes, Ethics in research – APA Ethics code

UNIT II QUANTITATIVE METHODS FOR PROBLEM SOLVING

UNIT III DATA DESCRIPTION AND REPORT WRITING
Tabular and graphical description of data: Tables and graphs of frequency data of one variable, Tables and graphs that show the relationship between two variables, Relation between frequency distributions and other graphs, preparing data for analysis Structure and Components of Research Report, Types of Report, Layout of Research Report, Mechanism of writing a research report, referencing in academic writing.

UNIT IV INTELLECTUAL PROPERTY

UNIT V PATENT RIGHTS

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods
REFERENCE BOOKS:


COURSE OUTCOMES:
Upon completion of this course, the students will be able to:

CO1: Develop research question[Usage]

CO2: Perform exhaustive literature survey[Usage]

CO3: Apply right problem solving methods[Usage]

CO4: Prepare data for analysis[Usage]

CO5: Write research report[Usage]

COURSE ARTICULATION MATRIX:

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L-Low, M-Moderate (Medium), H-High
18SEPC01 - COMPUTER METHODS OF STRUCTURAL ANALYSIS

PREREQUISITES: Nil

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COURSE OBJECTIVE:
- To analyse the structures by matrix methods and energy concepts.

UNIT I - FUNDAMENTAL CONCEPTS (9)

UNIT II - ENERGY CONCEPTS AND TRANSFORMATION OF INFORMATION (9)
Strain energy in terms of stiffness & flexibility matrices–Betti’s law – Application of Betti’s law - Computing displacements and forces from virtual work – other energy theorems - Transformation of forces and displacements in general – Stiffness and flexibility in general - Normal coordinates and orthogonal transformation – Principle of contragradience.

UNIT III - FLEXIBILITY METHOD (9)
Statically determinate structures – Indeterminate structures – Choice of redundants leading to ill and well conditioned matrices Transformation to one set of redundants to another – Internal forces due to thermal expansion and lack of fit – Reducing the size of flexibility matrix – Application to pin- jointed plane truss – continuous beams – Frames –Grids (Concept only).

UNIT IV - STIFFNESS METHOD (9)
Introduction – Development of the stiffness method – Analogy between flexibility and stiffness – lack of fit – Application of stiffness approach to pin jointed plane truss – Continuous beams – Frames – Grids (Concept only) – Space frames introduction only – Static condensation technique- Direct stiffness approach.

UNIT V - ANALYSIS BY SUBSTRUCTURING AND ITERATION (9)
Analysis by substructuring technique using the stiffness and the flexibility method with tridiagonalisation. Iteration method for frames with non-prismatic members.

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS:

COURSE OUTCOME:
The students are able to,

**CO 1:** apply fundamental principles to evaluate the characteristics of structures
**CO 2:** use energy concepts to analyse the structures and transform information in structures.
**CO 3:** Apply the flexibility matrix method for the analysis of beams, trusses and frames.
**CO 4:** Analyze the continuous beams, frames and trusses using stiffness matrix methods.
**CO 5:** Perform complex analysis procedures such as sub structuring and iteration techniques.

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L-Low, M-Moderate (Medium), H-High
PREREQUISITES: Nil

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COURSE OBJECTIVE:

- To impart knowledge on the limit state design of RCC Structural components and to inculcate design methodologies of special structural elements as per Indian standard code of practice.

UNIT I - DESIGN OF BEAMS

Behaviour of RCC beams under combined Shear, Torsion and Bending-Modes of Failures-Inter action effects - Analysis and design of beams circular in plan and Spandrel beams-Design for Serviceability Limit states - Design calculation of deflections and crack width according to IS 456-2000.

UNIT II - DESIGN OF SLENDER COLUMNS

Behaviour of slender RCC Columns- Failure modes and Interaction curves-Additional Moment method-Comparison of codal provisions- calculation of design moments for braced and unbraced columns-Principles of Moment magnification method-design of slender columns.

UNIT III - DESIGN OF SPECIAL RC ELEMENTS

Design and detailing of Concrete braced and unbraced walls according to BIS code - Classification of shear walls, design principles, design of rectangular and flanged shear walls- Design and detailing of Corbels - Design and detailing of Deep beams- Approximate analysis and design of Grid floors.

UNIT IV - DESIGN OF FLAT SLABS AND FLAT PLATES

Yield line theory of slabs - Hillerberg method of design of slabs- Design of Flat slabs and flat plates according to BIS method-Shear in Flat Slabs and Flat Plates.

UNIT V - INELASTIC BEHAVIOUR OF CONCRETE BEAMS AND FRAMES


Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS:


COURSE OUTCOME:
The students are able to,

CO 1: Design the beams subjected to torsion and verify the serviceability criteria.
CO 2: Design the slender columns based on various methods.
CO 3: Design various special RC elements namely RC walls, corbels, deep beams, grid floors.
CO 4: Apply the concepts of yield line theory and design of flat slabs and flat plates as per IS codes.
CO 5: Familiarize the concept of inelastic behaviour of concrete elements.

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L-Low, M-Moderate (Medium), H-High
PREREQUISITES: Nil  

COURSE OBJECTIVE:  
- To impart knowledge on elastic and plastic behavior of systems in Cartesian coordinates subjected to stresses and strain.

UNIT I - ELASTICITY AND SOLUTIONS (9)  

UNIT II - TORSION OF NON-CIRCULAR SECTION (9)  
St.venant’s approach - Prandtl’s approach: Membrane analogy - Torsion of thin walled open and closed sections.

UNIT III - ENERGY METHODS (9)  

UNIT IV - PLASTICITY (9)  
Physical Assumptions – Yield criteria - Plastic stress strain relationship. Elastoplastic problems in bending

UNIT V - CONSTITUTIVE MODELS (9)  
Metal Plasticity – Concrete and Soil Plasticity – Failure criterion and Constitutive models for the above materials

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS:
5. Sadhu Singh “Theory of Elasticity and metal forming processes”, Khanna publishers,2005
COURSE OUTCOME:
The students are able to,

**CO 1:** Understand the stress, deformation and constitutive relations.

**CO 2:** Analyze torsion of non-circular sections and thin walled sections

**CO 3:** Apply the concept of energy methods for elasticity problems.

**CO 4:** Familiarize the concept of plasticity and its applications in elasto plastic problems.

**CO 5:** demonstrate the plasticity constitutive models for various materials.

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L-Low, M-Moderate (Medium), H-High
PREREQUISITES: Nil

COURSE OBJECTIVE:
- To have exposure on instruments and to conduct experiments on various structural elements to identify its behaviour.

SYLLABUS CONTENT:
1. Introduction to instrumentation (LVDT, Load cell, Hydraulic jack, Strain gauges)
2. Casting and Testing of Reinforced Concrete beams for deflection, flexure and shear.
4. Fabrication and testing of elements for steel structures
5. Use of Non destructive testing (NDT) equipments – Rebound hammer, Ultra sonic pulse velocity meter and Rebar locator

COURSE OUTCOMES:
The students are able to

CO 1: Familiarize with the various instruments used for testing structural elements.
CO 2: Execute the test on reinforced concrete beams.
CO 3: Conduct the experiments on reinforced concrete columns, joints and frames.
CO 4: Fabricate and conduct test on various steel elements.
CO 5: Employ Non destructive testing equipments for testing of structures.

Lecture: 0 Periods    Tutorial: 0 Periods    Practical: 45 Periods    Total: 45 Periods

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18SEPC05 – FINITE ELEMENT ANALYSIS

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PREREQUISITES: Nil

COURSE OBJECTIVE:
- To impart knowledge on the concepts of Finite Element Method and to analyse various finite elements using different techniques.

UNIT I - INTRODUCTION (9)

UNIT II - ELEMENT PROPERTIES (9)

UNIT III - ISOPARAMETRIC ELEMENTS (9)
Basic principles of Shape Functions - Mapping – Uniqueness of mapping - Sub – Iso – Super parametric elements – Numerical integration using Gaussian Quadrature - Examples in one dimension and two dimension

UNIT IV - AXISYMMETRIC STRESS ANALYSIS (9)
Analysis of solids of revolution under axisymmetric loading – Formulation of axisymmetric solid element – Simple examples

UNIT V - NONLINEAR ANALYSIS (9)
Types of nonlinearities – Geometric nonlinearity – Material nonlinearity – Introduction to nonlinear solution techniques – Newton Raphson and Modified Newton Raphson methods

Lecture: 45 Periods   Tutorial: 0 Periods   Practical: 0 Periods   Total: 45 Periods

REFERENCE BOOKS:

**COURSE OUTCOME:**
The students are able to,

**CO 1:** Familiarize the basic concepts of FEM and analyse bars, beams, trusses and frames using direct element method.

**CO 2:** Apply the knowledge on element properties to solve various problems.

**CO 3:** Find solutions for problems involving isoparametric elements.

**CO 4:** Analyse solid elements using axisymmetric stress analysis.

**CO 5:** Identify the different types of non linearities and apply non linear solution techniques.

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PREREQUISITES: Nil

COURSE OBJECTIVE:
- To impart knowledge on analysis of SDOF and MDOF systems subjected to dynamic loading by various techniques.

UNIT I - SINGLE DEGREE OF FREEDOM SYSTEMS
Formulation of equation of motion, Free and forced vibrations, Response to dynamic loading, Effect of damping.

UNIT II - MULTI DEGREE OF FREEDOM SYSTEMS

UNIT III - CONTINUOUS SYSTEMS
Dynamics of distributed parameter systems, Free and forced vibration of flexural beams, shear beams and columns.

UNIT IV - TRANSIENT AND DYNAMIC RESPONSE OF STRUCTURES
Idealisation of structures to mathematical models, Mode superposition method, Numerical integration procedures

UNIT V – NUMERICAL METHODS IN STRUCTURAL DYNAMICS

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS:
**COURSE OUTCOME:**
The students are able to,

**CO 1:** Evaluate the response of SDOF and MDOF systems under dynamic loading.

**CO 2:** Analyze the continuous systems subjected to periodic and impulsive loading.

**CO 3:** Familiarize with the various vibration processes and response of structures.

**CO 4:** Analyze the multi degree of freedoms under dynamic loading.

**CO 5:** Familiarize with the numerical methods in structural dynamics.

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L-Low, M-Moderate (Medium), H-High
PREREQUISITES: Nil

COURSE OBJECTIVE:
- To impart knowledge on design of connections, industrial structures, light gauge sections and industrial building.

UNIT I - REVIEW OF DESIGN PHILOSOPHIES (9)

UNIT II - BEHAVIOUR AND DESIGN OF CONNECTIONS (9)
Connection behaviour - Bolted and welded connections-unstiffened and stiffened seat connections –framed connections- Connections for force and moment transmission-tee stub and End plate connections- Column stiffeners and other reinforcement-principles of semi rigid connections

UNIT III - ANALYSIS AND DESIGN OF INDUSTRIAL BUILDINGS (9)
Review of loads on structures-Dead, Live, wind and Seismic loads as per National standards- Analysis and Design of Industrial buildings and bents-Sway and non-sway frames- Design of Purlins - Analysis and Design of Gable frames.

UNIT IV - ANALYSIS AND DESIGN OF COLD-FORMED STEEL STRUCTURES (9)
Types of cross sections-concepts of local buckling, and Effective width-Design of compression and tension members- concepts of lateral buckling –Design of Beams, deflections of beams and design of beam webs- Combined stresses and connections- Empirical design of Z-purlins with lips and wall studs.

UNIT V - SPECIAL REQUIREMENTS OF DESIGN AND CONSTRUCTION (9)
Fire resisting properties of steel – Principles of Fire-resistant Design - Fatigue failures of steel structures – Principle of Fatigue-resistant Design As per IS code- Seismic Behaviour and advantages of steel – Principles of Earthquake resistant design of Steel Structures.

REFERENCE BOOKS:

**COURSE OUTCOME:**

The students are able to,

- **CO 1**: Understand various design philosophies as per various international codes.
- **CO 2**: Design different types of eccentric bolted and welded connections.
- **CO 3**: Analyse and design the components of industrial buildings.
- **CO 4**: perform design of cold formed steel structures.
- **CO 5**: Design of steel structures for fire, fatigue and understand the principles of earthquake resistant design.

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L-Low, M-Moderate (Medium), H-High
PREREQUISITES: Nil

**COURSE OBJECTIVE:**

- To provide students with an introduction to Finite Element Analysis and to help the students use this method and commercial software package to solve problems in mechanics of materials and structural engineering.

1. Finite element analysis of simple beams
2. Finite element analysis of trusses
3. Finite element analysis of frames
4. Finite element analysis of element subjected to combined axial load and bending.
5. Finite element analysis of complex elements.

**Finite element analysis of above problems using commercially available finite element analysis software packages.**

**COURSE OUTCOMES:**

The students are able to

**CO 1:** Perform finite element formulations for simple engineering problems.

**CO 2:** Develop the various structural models using commercially available software.

**CO 3:** Use commercial finite element software for analyzing the structural elements.

**CO 4:** Use finite element method to solve engineering problems.

**CO 5:** Develop and validate the numerical model of structural elements.

Lecture: 0 Periods  Tutorial: 0 Periods  Practical: 45 Periods  Total: 45 Periods

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L-Low, M-Moderate (Medium), H-High
COURSE OBJECTIVE:
- To develop knowledge on design and detailing of structures.

COURSE CONTENT:
- Design Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the design problem based on the recent trends and analyse the structural system using various techniques.
- End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted, analysis, design and detailing of the entire structural system.

Continuous assessment of Design Project will be monitored by the departmental committee.

Lecture: 0 Periods  Tutorial: 0 Periods  Practical: 60 Periods  Total: 60 Periods

COURSE OUTCOMES:
The students are able to
CO 1: Identify structural engineering problems based on the current scenario.
CO 2: Familiarize with the various loads and load combinations as per IS codes.
CO 3: Apply different techniques to analyze complex structural systems.
CO 4: Acquire hands on experience in the analysis and design of entire structure.
CO 5: Prepare the structural drawings for concrete/steel structures.

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L-Low, M-Moderate (Medium), H-High
COURSE OBJECTIVE:

- To carry out the independent research work on the chosen topic and submit a thesis for evaluation.

COURSE CONTENT:

The project work is defined based on the interest of the students to specialize in a particular Structural Engineering area. Students are expected to carry out independent research work on the chosen topic and submit a thesis for evaluation.

The work at this stage may involve extensive review of literature in the chosen area of interest. Based on the literature review, the project may be carried out by numerical simulation using software packages and/or experimental work.

The students will give three periodical review seminars.

After completion of the thesis work, the student shall prepare and submit a report. The work will be evaluated by the panel of examiners.

Lecture: 0 Periods   Tutorial: 0 Periods   Practical: 300 Periods   Total: 300 Periods

COURSE OUTCOME:

The students are able to

CO 1: Collect the literatures relevant to their area of research.

CO 2: Identify the research problems based on current scenario.

CO 3: Perform analytical investigation.

CO 4: Conduct experimental work.

CO 5: Interpret the results and prepare the report.

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L-Low, M-Moderate (Medium), H-High
18SEEE03 - PROJECT PHASE II

Category: EEC

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COURSE OBJECTIVE:

To develop the skills to formulate the methodology for the chosen topic, carry out the extensive research work and submit a thesis for evaluation.

COURSE CONTENT:

Students are expected to carry out research work on the chosen topic and submit a thesis for evaluation. The work at this stage may involve review of literature, extensive experimental work and/or Numerical simulation using software packages, development of analytical model, case study, field data collection and analysis etc. The students will give a periodical review seminar on each stage.

Student shall prepare a report on the project work outlining a review of literature published in the relevant area, need, objective and scope of work, methodology, and discusses about the results and come out with appropriate conclusions.

After completion of the thesis, the student shall prepare and publish a paper related to the thesis work in a Journal/Conference. The student shall have to appear for a Viva-voce examination for the thesis.

Lecture: 0 Periods  Tutorial: 0 Periods  Practical: 480 Periods  Total: 480 Periods

COURSE OUTCOME:

The students are able to
CO 1: Collect the literatures relevant to their area of research.
CO 2: Identify the research problems based on current scenario.
CO 3: Perform analytical investigation.
CO 4: Critically assess and propose solutions to Structural Engineering problems.
CO 5: Demonstrate the research findings and present the solutions of the thesis work.

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L-Low, M-Moderate (Medium), H-High
COURSE OBJECTIVE:

* To familiarize with numerical solutions of equation with one variable and system of equations.
* To obtain the knowledge of numerical interpolation, numerical differentiation and numerical integration.
* To acquire knowledge of numerical solution to first order ordinary differential equations using single and multi step techniques.
* To gain the knowledge of numerical solution to second order partial differential equations using explicit and implicit methods.

UNIT I - SOLUTIONS OF EQUATIONS AND EIGEN VALUE PROBLEMS (9)

UNIT II - CURVE FITTING AND INTERPOLATION (9)
Curve fitting: Method of least squares – Fitting a straight line, parabola and curves reducible to linear form, Newton’s divided difference formula - Lagrange’s interpolation - Newton Forward and backward difference formula.

UNIT III - NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION (9)
Numerical approximation of derivatives using interpolation polynomials - Numerical integration by Trapezoidal, Simpson’s one third and Simpson’s three eighth rules - Two point and three point Gaussian quadrature formula - Double integration using Trapezoidal and Simpson one third rule.

UNIT IV - NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS (9)
Taylor series method - Euler method - Modified Euler method - Fourth order RungeKutta method for solving first order equations - Predictor and corrector methods: Milne’s and Adam Bashforth methods

UNIT V - NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS (9)
Finite difference solutions for the second order ordinary differential equations - Finite difference solutions for one dimensional Heat Equation (Both Explicit and Implicit Methods) – One dimensional wave equation - Laplace and Poisson equation.

Lecture: 45 Periods    Tutorial: 0 Periods    Practical: 0 Periods    Total: 45 Periods
REFERENCE BOOKS:

COURSE OUTCOMES:
The student will be able to

CO1: Understand the numerical solutions to algebraic, exponential, logarithmic, transcendental and linear system of simultaneous equations.

CO2: Acquire fluency in numerical interpolation techniques with equal and unequal intervals.

CO3: Understand the techniques of finite differences to apply for numerical differentiation, numerical quadrature and numerical cubature.

CO4: Understanding numerical solution to first order ordinary differential equations by different methods like single step and multistep etc.

CO5: Understanding numerical solution to second order partial differential equations by different methods using finite differences.

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PREREQUISITES: Nil

COURSE OBJECTIVE:
• To impart knowledge on cost effective designs, conventional and non-conventional optimization techniques for engineering applications.

UNIT I - OPTIMIZATION FUNDAMENTALS

UNIT II - LINEAR PROGRAMMING
Linear Programming – Formulation of problems- graphical solution- plastic design of frames- analytical methods- Simplex method – Basic ideas and steps- Duality sensitivity analysis – simple LP problems – Transportation Problem – Assignment Method.

UNIT III - NON-LINEAR PROGRAMMING
Unconstrained multivariable function - univariate method- Cauchy’s steepest descent method- conjugate gradient method (Fletcher Reeves) – Variable metric methods (Davison-Fletcher-Powell) - Direct and indirect methods- cutting plane method- Methods of feasible direction- Interior Penalty function – External Penalty function method.

UNIT IV - GEOMETRIC PROGRAMMING AND DYNAMIC PROGRAMMING

UNIT V - NON-TRADITIONAL METHODS (concepts only)

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods
REFERENCE BOOKS:

COURSE OUTCOME:
The students are able to,

CO 1: Understand the fundamentals of various optimization techniques.

CO 2: Formulate and solve linear programming problems.

CO 3: Familiarize the various methods for solution of Non linear programming problems.

CO 4: Use the various solution techniques for Geometric and Dynamic Programming problems.

CO 5: Understand the concepts of non traditional methods.

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L-Low, M-Moderate (Medium), H-High
PREREQUISITES: Nil

COURSE OBJECTIVE:
- To develop knowledge on identification of research problem based on the literature review and propose methodology.

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 - GOVERNING EQUATIONS
Navier Solutions of Cross-Ply and Angle-Ply Laminated Simply Supported Plates, Determination of Stresses, Levy Solutions for Plates with Other Boundary Conditions, Analytical Solutions for Bending of Rectangular Laminated Plates using FSDT.

UNIT III - CLASSICAL LAMINATED PLATE THEORY

UNIT IV - FIRST ORDER SHEAR DEFORMATION THEORY
Finite Element Solutions for Bending of Rectangular Laminated Plates using FSDT. Finite Element Model, C0 Element Formulation, Post Computation of Stresses.

UNIT V - ANALYTICAL METHODS
Analysis of Rectangular Composite Plates using Analytical Methods.

Lecture: 45 Periods    Tutorial: 0 Periods    Practical: 0 Periods    Total: 45 Periods

REFERENCE BOOKS:

**COURSE OUTCOMES:**
The students are able to

**CO 1:** Understand the various theories behind the analysis of laminated composite plates.

**CO 2:** Develop the governing equations for laminated composite plates.

**CO 3:** Apply the Classical Laminated Plate Theory on laminated plates using FEM.

**CO 4:** Execute the FEM analysis of laminated plates using First Order Shear Deformation Theory

**CO 5:** Analyse the rectangular laminated composite plate using the analytical method.

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**L-Low, M-Moderate (Medium), H-High**
COURSE OBJECTIVE:
- To get an idea on soil structure interaction, soil foundation models, finite difference and finite element analysis and elastic analysis of piles and piled raft.

UNIT I - SOIL - FOUNDATION INTERACTION (9)

UNIT II - BEAMS ON ELASTIC FOUNDATION - SOIL MODELS (9)
Infinite beam – Two parameters – Isotropic elastic half space – Analysis of beams of finite length – Classification of finite beams in relation to their stiffness – Analysis through application packages.

UNIT III - PLATE ON ELASTIC MEDIUM (9)

UNIT IV - ELASTIC ANALYSIS OF PILE (9)

UNIT V - LATERALLY LOADED PILE (9)
Load deflection prediction for laterally loaded piles – Subgrade reaction and elastic analysis – Interaction analysis – Pile raft system – Solutions through influence charts – Application packages.

Lecture: 45 Periods   Tutorial: 0 Periods   Practical: 0 Periods   Total: 45 Periods

REFERENCE BOOKS:


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

**CO1**: Understand various soil response models applicable to soil-foundation interaction analysis.

**CO2**: Come up with elastic solutions for problems of pile, pile-raft system.

**CO3**: Use software packages to analyze soil-foundation system including laterally loaded piles.

**CO4**: Acquire knowledge on elastic analysis of pile and pile group

**CO5**: Acquire knowledge on analysis of laterally loaded piles

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L-Low, M-Moderate (Medium), H-High
PREREQUISITES: Nil

COURSE OBJECTIVE:

To acquire knowledge about design of pipes, concrete roofing, design of water tank and special structures.

UNIT I - DESIGN OF PIPES
Structural design of Concrete, Prestressed Concrete, Steel and Cast iron pipes - piping mains – joints – Leak detection - sewerage tank design – anchorage for pipes – massive outfalls – structural design - laying – Testing - hydrodynamic considerations - Advances in the manufacture of pipes.

UNIT II - DESIGN OF CONCRETE ROOFING SYSTEMS

UNIT III - ANALYSIS AND DESIGN OF WATER TANKS
IS Codes for the design of water retaining structures. Design of circular, rectangular, spherical and Intze type of tanks using concrete. Design of prestressed concrete cylindrical tanks – Economic analysis – introduction to computer aided design and packages.

UNIT IV - DESIGN OF SPECIAL PURPOSE STRUCTURES
Underground reservoirs and swimming pools, Intake towers, Structural design including foundation of water retaining structures such as settling tanks, clarifier-flocculators, aeration tanks, etc.,- effect of earth pressure and uplift considerations – selection of materials of construction.

UNIT V - REPAIR AND REHABILITATION OF STRUCTURES
Diagnosing the cause and damage, identification of different types of structural and non-structural cracks – repair and rehabilitation methods for Masonry, Concrete and Steel Structures. Exposure on Steel, Lattice Structures used in water and sewerage works.

Lecture: 45 Periods   Tutorial: 0 Periods   Practical: 0 Periods   Total: 45 Periods

REFERENCE BOOKS:

COURSE OUTCOMES:
At the end of the course students will be able to

CO1: Design concrete roofing systems, pipelines and pumping stations.
CO2: Analyze and Design water tanks and special purpose structures
CO3: Get knowledge about serviceability and durability of structures.
CO4: To acquire knowledge about design of pipes and concrete roofing
CO5: Able to do design of water tank and special structures

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L-Low, M-Moderate (Medium), H-High
PREREQUISITES: Nil

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COURSE OBJECTIVE:
• To impart Knowledge on the concepts of stability and phenomenon of buckling and its effects on structural components

UNIT I - CONCEPT OF STABILITY
Concept of stability approaches to stability analysis, characteristics. Columns Buckling of columns with various end conditions, imperfect columns, non prismatic columns.

UNIT II - APPLICATION OF STABILITY

UNIT III - BEAM-COLUMNS

UNIT IV - TORSIONAL BUCKLING
Torsional Load-Deformation characteristics of Structural members – Strain energy of Torsion – Combined torsional and flexural buckling - Lateral buckling of beams – Pure bending of simply supported beam and cantilever beam – Design simplifications for lateral buckling.

UNIT V - BUCKLING OF PLATES
Buckling of thin plates with various edge conditions – Strain energy of bending in a plate – Calculation of critical load of plates – Inelastic buckling – Post buckling behavior of axially compressed plates – Ultimate strength of axially compressed plates.

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS:
**COURSE OUTCOME:**
The students are able to,

**CO 1:** Understand basic concepts of structural stability, various approaches to

**CO 2:** Execute and workout the inelastic buckling using various methodologies

**CO 3:** Understand the application of various methods, concepts and examine the buckling behaviour of beam columns and frames.

**CO 4:** Examine the lateral buckling, torsional buckling and flexural torsional buckling of various beams

**CO 5:** develop stability analysis of various structural members and methods of analysis of buckling of thin plates.

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L-Low, M-Moderate (Medium), H-High
PREREQUISITES: Nil

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COURSE OBJECTIVE:
- To impart knowledge on cement composite materials, behaviour and its applications.

UNIT I - INTRODUCTION

UNIT II - MECHANICAL BEHAVIOUR

UNIT III - CEMENT COMPOSITES
Types of Cement Composites, Terminology, Constituent Materials and their Properties, Construction Techniques for Fibre Reinforced Concrete - Ferrocement, SIFCON, Polymer Concretes, Preparation of Reinforcement, Casting and Curing.

UNIT IV - MECHANICAL PROPERTIES OF CEMENT COMPOSITES
Behaviour of Ferrocement, Fiber Reinforced Concrete in Tension, Compression, Flexure, Shear, Fatigue and Impact, Durability and Corrosion.

UNIT V - APPLICATION OF CEMENT COMPOSITES:

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS:

COURSE OUTCOMES:
The students are able to

CO 1: Formulate constitutive behaviour of composite materials by understanding their strain-stress behaviour.

CO 2: Estimate strain constants using theories applicable to composite materials.

CO 3: understand the construction techniques of various cement composites.

CO 4: Familiarize the mechanical properties of cement composites.

CO 5: Classify and identify the appropriate composite material based on its behaviour and properties.

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18SEPE08 - ADVANCED CONCRETE TECHNOLOGY

PREREQUISITES: Nil

COURSE OBJECTIVE:
- To impart knowledge on the advancements in the field of Concrete Technology and sustainable construction.

UNIT I - INTRODUCTION (9)

UNIT II - ADMIXTURES AND POLYMERS (9)
Chemical Admixtures- Mechanism of chemical admixture, Plasticizers and super Plasticizers and their effect on concrete property in fresh and hardened state, Marsh Cone test for optimum dosage of super plasticizer, retarder, accelerator, Air-entraining admixtures, and new generation super plasticiser.
Mineral Admixture-Fly ash, Silica fume, GGBS, and their effect on concrete property in fresh state and hardened state.
Polymers in Civil Engineering-Structural Plastics And Composites- Polymer Membranes Coatings.

UNIT III - DURABILITY PROPERTIES (9)

UNIT IV - SPECIAL CONCRETE (9)

UNIT V - SUSTAINABILITY (9)
Introduction - Need for sustainability - Concept of sustainability - social, environmental and economic sustainability concepts. Sustainable development - Engineering for sustainable development - Threats for sustainability - Low Impact development techniques-Green materials -Material selection for sustainable design

Lecture: 45 Periods    Tutorial: 0 Periods    Practical: 0 Periods    Total: 45 Periods
REFERENCE BOOKS:

COURSE OUTCOME:
The students are able to,
CO 1: Understand the overview of concrete behaviour and various NDT Test methods.
CO 2: Familiarize about the various admixtures and polymers.
CO 4: Familiarize about the various types of special concrete.
CO 5: Understand the definition, need and concepts of sustainability.

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L-Low, M-Moderate (Medium), H-High
18SEPE09 – FRACTURE MECHANICS

Category: PE

PREREQUISITES: Nil

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**COURSE OBJECTIVE:**

- To identify the modes of failure, types of fracture and determination of fracture parameters, the concept of elasto-plastic fracture and mechanics of concrete fracture.

**UNIT I - INTRODUCTION** (9)

History of fracture mechanics – Fracture mechanics approach to design – Effect of material properties on fracture – Dimensional Analysis in Fracture mechanics.

**UNIT II - LINEAR ELASTIC FRACTURE MECHANICS** (9)

Stress Concentration effect – Griffith Energy Balance – Energy release rate – R Curve – Crack Tip Plasticity

**UNIT III - ELASTIC PLASTIC FRACTURE MECHANICS** (9)

Crack Tip Opening Displacement – J Integral – Crack Growth Resistance curves - Scaling Model for Cleavage fracture

**UNIT IV - FRACTURE MECHANISMS IN METALS AND NON-METALS** (9)


**UNIT V - FRACTURE TOUGHNESS TESTING OF METALS AND NON-METALS** (9)

General Considerations – KIC testing – J testing - CTOD testing – Qualitative toughness tests.

**REFERENCE BOOKS:**

COURSE OUTCOME:
The students are able to,

**CO 1**: Understand the basics of fracture mechanics and dimensional analysis.

**CO 2**: Recognize the different fracture mechanisms and modes of fracture.

**CO 3**: Analyze the behavior of plastic materials, fracture analysis of concrete and various non-linear models.

**CO 4**: Predict various fracture parameters for brittle and ductile materials.

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L-Low, M-Moderate (Medium), H-High
18SEPE10 – SUBSTRUCTURE DESIGN

Category: PE

PREREQUISITES: Nil

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COURSE OBJECTIVE:

- To discuss and evaluate the feasibility of foundation solutions to different types of soil conditions considering the time effect on soil behavior and to build the necessary theoretical background for design and construction of foundation systems.

UNIT I - INTRODUCTION


UNIT II - DESIGN OF SHALLOW FOUNDATION


UNIT III - DESIGN OF DEEP FOUNDATION

Deep foundation – Load carrying capacity of different types of piles and detailing of reinforcement according to IS 2911 – Design of pile caps – Uplift capacity of piles – Lateral pile load test.

UNIT IV - FOUNDATION FOR BRIDGES AND MACHINES


UNIT V - TOWER FOUNDATIONS


Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS:

**COURSE OUTCOME:**
The students are able to,

**CO 1:** Interpret subsurface information and to identify a suitable foundation system for a structure.

**CO 2:** Design shallow foundations for various types of structures.

**CO 3:** Calculate capacity of piles and Design deep foundation.

**CO 4:** Analyse and design foundations for bridges and machines.

**CO 5:** Analyse and Design foundations for tall towers.

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L-Low, M-Moderate (Medium), H-High
COURSE OBJECTIVE:

- To provide relevant knowledge on planning and functional requirements of structures and design of industrial building systems, material handling systems and multistorey building systems

UNIT I - PLANNING AND FUNCTIONAL REQUIREMENTS (9)
Planning of an industrial building based on the functional requirements, Lighting and ventilation - Fire safety norms - factories act, Different types of loadings.

UNIT II - INDUSTRIAL FRAMING (9)
Types of roofing Design of Roof, Portals, Pre Engineered Buildings - Design of multi storied deck slab, Steel platform, wind columns - Foundations and pedestals.

UNIT III - MATERIAL HANDLING SYSTEMS (9)

UNIT IV - INDUSTRIAL STORAGE STRUCTURES (9)
Design of silos, bins and bunkers – Design of supporting system for storage hoppers and bunkers.

UNIT V - ENVIRONMENTAL CONTROL STRUCTURES (9)
Concept of Electro-static precipitators, functioning and components – wet and dry scrubbers – Design of chimneys – Self supporting, Guyed and braced.

Lecture: 45 Periods   Tutorial: 0 Periods   Practical: 0 Periods   Total: 45 Periods

REFERENCE BOOKS:
1. Bye law's of Inspector of Factories
**COURSE OUTCOMES:**
The students are able to,

**CO1:** Acquire the knowledge about the planning and functional requirements of Industrial structures.

**CO2:** Understand the current design trends of multistorey building systems and industrial structures.

**CO3:** Design the crane girder and gantry girder.

**CO4:** Design the silos, bunkers and bins along with supporting structures.

**CO5:** Understand and design the environmental control structures.

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L-Low, M-Moderate (Medium), H-High
18SEPE12 – DESIGN OF CONCRETE BRIDGES

Category: PE

PREREQUISITES: Nil

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COURSE OBJECTIVE:
- To impart knowledge on design of different types of reinforced concrete bridges, steel bridges and pre stressed concrete bridges along with the sub structures and foundation.

UNIT I - INTRODUCTION
(9)
Classification, investigations and planning, choice of type, I.R.C. Specifications for road bridges, standard live loads, other forces acting on bridges, general design considerations.

UNIT II - SHORT SPAN BRIDGES
(9)
Load distribution theories, analysis and design of slab culverts, tee beam and slab bridges.- Design Problems

UNIT III - LONG SPAN GIRDER BRIDGES
(9)
Design principles of continuous bridges, box girder bridges, bow string girder bridges, balanced cantilever bridges

UNIT IV - DESIGN OF PRESTRESSED CONCRETE BRIDGES
(9)
Flexural and torsional parameters – Courbon’s theory – Distribution co-efficient by exact analysis – Design of girder section – maximum and minimum prestressing forces – Eccentricity – Live load and dead load shear forces – Cable Zone in girder – check for stresses at various sections – check for diagonal tension – Diaphragms – End block – short term and long term deflections

UNIT V - BEARINGS, CONSTRUCTION AND MAINTENANCE OF BRIDGES
(9)

Lecture: 45 Periods   Tutorial: 0 Periods   Practical: 0 Periods   Total: 45 Periods

REFERENCE BOOKS:
**COURSE OUTCOME:**
The students are able to,

**CO 1:** Acquire basic knowledge on the planning and design aspects of bridges.

**CO 2:** Design the short span bridges and slab culverts.

**CO 3:** Design the long span girder bridges and box girder bridges.

**CO 4:** Design the pre stressed concrete bridges.

**CO 5:** Design the various components of bridges.

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L-Low, M-Moderate (Medium), H-High
## Course Objective:
- To impart knowledge on the basic principles of Prestressed concrete members and its design.

### Unit I - Analysis of Beams and Losses in Prestress (9)
- Principles of prestressing
- Different systems of prestressing
- Materials and Allowable stresses
- Elastic Design of prismatic beams
- Simple cable profile Design of beams for shear

**Losses and Deflection in Beams**
- Losses in prestress
- Deflections

### Unit II - Design of Tension and Compression Members (9)
- Design of compression and tension members
- Design of Compression members with bending
- End Block Introduction
- Stress Distribution in End Block
- Anchorage Zone Stresses
- Design of end block
- Guyon’s method
- Magnel’s method
- I.S 1343 recommendations

### Unit III - Continuous Beams and Composite Construction (9)
- Concept of concordancy and Linear Transformation
- Elastic analysis of continuous beams
- Sketching of pressure lines for continuous beams and single span single storey rigid frames
- Load balancing method
- Design of continuous beams
- Composite construction
- Types and behavior
- Analysis and design for flexure and shear
- Differential shrinkage

### Unit IV - Special Topics (9)
- One way slabs
- Two way slabs
- Circular prestressing
- Prestressed concrete pipes
- Analysis and design of liquid retaining tanks
- Design of prestressed concrete sleepers and poles

### Unit V - Limit State Design (9)
- Safety and Serviceability requirements
- Partial safety factors
- Limit state Design of beams in flexure and shear
- Limit state Design of Compression members
- Non prestressed reinforcements
- Partial prestressing

### Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods

### Reference Books:

COURSE OUTCOME:
The students are able to,

CO 1: Understand the principles of prestressing and design the PSC beam sections.
CO 2: Design the prestressed concrete tension, compression members and end block.
CO 3: Analyse the statically indeterminate structure and design the continuous beams and composite beams.
CO 4: Design the prestressed concrete pipes, sleepers, tanks, poles and slabs.
CO 5: Understand the limit state design concept of PSC beams and compression members.

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L-Low, M-Moderate (Medium), H-High
COURSE OBJECTIVE:
- To impart the required knowledge on basic hypothesis, theorems and applications of plastic analysis.

UNIT I - BASIC HYPOTHESIS  (9)
Introduction to plastic method of structural analysis – basic hypothesis - stress strain relation for mild steel – evaluation of fully plastic hinge assumption for other structural materials. Failure and Yield criteria (Von Mises and Tresca)

UNIT II - METHODS AND THEOREMS OF PLASTIC ANALYSIS  (9)

UNIT III - APPLICATION OF PLASTIC ANALYSIS  (9)
Application of the methods to multi storey frames - Beams and frames with concentrated and distributed loads - Virendeel trusses – Gable frames and Grids.

UNIT IV - DISPLACEMENTS  (9)
Importance of displacements in plastic analysis – Methods of computing displacements – Displacements in beams and frames – Displacement theorem.

UNIT V - AXIAL FORCES IN FRAMES AND ARCHES  (9)
Combined axial and bending forces - Effect of axial forces in simple frames – Approximate interaction curves.

REFERENCE BOOKS:
**COURSE OUTCOME:**

The students are able to,

**CO 1:** Understand the basic hypothesis of plastic analysis and yield criteria.

**CO 2:** Acquire knowledge on methods and theorems of plastic analysis.

**CO 3:** Analyse multistorey frames and virendeel trusses using plastic analysis.

**CO 4:** Evaluate the displacements in beams and frames.

**CO 5:** Acquire knowledge on effects of axial forces in frames and arches.

**COURSE ARTICULATION MATRIX:**

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PREREQUISITES: Nil

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COURSE OBJECTIVE:
- To impart knowledge on structural behaviour and analysis of different types of plates and shells under different boundary conditions.

UNIT I - LATERALLY LOADED PLATES (9)

UNIT II - NUMERICAL METHODS (9)
Finite Difference Method – Isotropic Rectangular plates – Boundary Conditions – All-round simply supported square plate, clamped square plate and fixed square plate subjected to uniformly distributed load.

UNIT III - ANISOTROPIC PLATES AND THICK PLATES (9)
Orthotropic Plates and Grids, Moderately Thick Plates.

UNIT IV - MEMBRANE THEORY OF SHELLS (9)
Classification of Shells - Types of Shells - Structural Action - Membrane Theory - Shells of Revolution and Shells of Translation - Examples - Limitations of Membrane Theory.

UNIT V - FOLDED PLATES (9)
Folded Plate structures - structural behavior and analysis - Types - Design by ACI - ASCE Task Committee method.

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS:

COURSE OUTCOME:
The students are able to,
CO 1: Analyse the plates subject to vertical and gravity load.
CO 2: Apply various numerical methods for analysis of plates.
CO 3: Analyse the anisotropic plates and thick plates.
CO 4: Analyse and design of shells.
CO 5: Analyse and design of folded plates.
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L-Low, M-Moderate (Medium), H-High
COURSE OBJECTIVE:
- To emphasize the importance of maintenance, inspection of structures and to impart fundamental knowledge on various repairing strategies

UNIT I - GENERAL (9)
Quality assurance for concrete construction as built concrete properties strength, permeability, thermal properties and cracking and types of cracks.

UNIT II - MAINTENANCE AND REPAIR STRATEGIES (9)
Definitions : Maintenance, repair and rehabilitation, Facets of Maintenance, importance of Maintenance Preventive measures on various aspects Inspection, Assessment procedure for evaluating a damaged structure causes of deterioration - testing techniques.

UNIT III - MATERIALS FOR REPAIR (9)
Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, ferro cement, Fiber reinforced concrete.

UNIT IV - TECHNIQUES FOR REPAIR (9)
Rust eliminators and polymers coating for rebars during repair foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shot Crete - Epoxy injection, Mortar repair for cracks, shoring and underpinning.

UNIT V - EXAMPLES OF REPAIR TO STRUCTURES (9)
Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering wear, fire, leakage, marine exposure.

REFERENCE BOOKS:

COURSE OUTCOME:
The students are able to,

**CO 1**: Identify the causes of distress in concrete structures by conducting various tests.

**CO 2**: Familiarize the maintenance and repair strategies.

**CO 3**: Familiarize about the materials for repair and to suggest appropriate materials for repair.

**CO 4**: Demonstrate the remedial measures for various structures using proper techniques.

**CO 5**: Acquire sufficient knowledge to use appropriate methods of demolition techniques for damaged structures.

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L-Low, M-Moderate (Medium), H-High
PREREQUISITES: Nil

COURSE OBJECTIVE:
- To give an exposure on measuring techniques, sensors and actuators.

UNIT I - INTRODUCTION

UNIT II - MEASURING TECHNIQUES
Strain measuring techniques using electrical strain gauges, types – resistance-capacitance – inductance- wheatstone bridges-pressure transducers-load cells- temperature compensation – strain rosettes

UNIT III - SENSORS AND ACTUATORS
Sensing technology – types of sensors – physical measurement using piezo electric strain measurement – inductively read transducers – LVDT – fiber techniques - fiber optic strain sensors - Actuator techniques – Actuator and Actuator materials - piezo electric and electro resistive material – magneto structure material – shape memory alloys – electro ortheological fluids – electromagnetic actuation – role of actuators and actuator materials

UNIT IV - SIGNAL PROCESSING AND CONTROL SYSTEMS
Data Acquisition and processing – signal processing and control for smart structures – sensors as geometrical processors – signal processing – control system – linear and non linear.

UNIT V - INTRODUCTION TO STRUCTURAL HEALTH MONITORING (SHM)
Definition & motivation for SHM, SHM – a way for smart materials and structures – SHM and bio mimetic – analog between the nervous system of a man and a structure with SHM, SHM as a part of system management, Passive and Active SHM, NDE, SHM and NDECS – basic components of SHM – Applications – SHM of a bridge – applications for external post tensioned cables, monitoring historical buildings.

Lecture: 45 Periods   Tutorial: 0 Periods   Practical: 0 Periods   Total: 45 Periods

REFERENCE BOOKS:

6. *Hand book on “Repair and Rehabilitation of RCC Buildings”*, Published by Director General, CPWD, Govt. of India, 2002.


**COURSE OUTCOME:**

The students are able to,

**CO 1:** Gain knowledge on smart materials and structures.

**CO 2:** Understand the function and response sensing systems

**CO 3:** Understand about the working mechanism of sensors and actuators.

**CO 4:** Use data acquisition signal processing and control systems effectively.

**CO 5:** Familiarize about Structural Health Monitoring system and its application in civil field.

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L-Low, M-Moderate (Medium), H-High
18SEPE18 - STRUCTURAL HEALTH MONITORING

Category: PE

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COURSE OBJECTIVE:
To acquire knowledge on structural health monitoring, Structural Audit, testing methods and rehabilitation techniques.

UNIT I - STRUCTURAL HEALTH

UNIT II - STRUCTURAL AUDIT
Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

UNIT III - STATIC FIELD TESTING
Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement.

UNIT IV - DYNAMIC FIELD TESTING
Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.

UNIT V - REPAIRS AND REHABILITATION TECHNIQUES
Case Studies (Site Visits), piezo–electric materials and other smart materials, electro–mechanical impedance (EMI) technique, adaptations of EMI technique.

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS:
COURSE OUTCOMES:
The students are able to
CO 1. Diagnosis the distress in the structure by understanding the causes and factors.
CO 2. Prepare the structural audit report.
CO 3. Access the health of the structure using static field testing.
CO 4. Analyse the condition of structures using dynamic field testing methods.
CO 5. Suggest repairs and rehabilitation measures of the structure

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L-Low, M-Moderate (Medium), H-High
COURSE OBJECTIVE:

To provide an exposure on the significance of formwork, materials and design procedures.

UNIT I - INTRODUCTION

UNIT II - FORMWORK DESIGN

UNIT III - FORMWORK DESIGN FOR SPECIAL STRUCTURES
Shells, Domes, Folded Plates, Overhead Water Tanks, Natural Draft Cooling Tower, 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 MultiStory Building Construction.

Lecture: 45 Periods    Tutorial: 0 Periods    Practical: 0 Periods    Total: 45 Periods

REFERENCE BOOKS:
2. Hurd, M.K., “Formwork for Concrete”, Special Publication No.4, American Concrete Institute, Detroit, 1996

COURSE OUTCOMES:
The students are able to

CO 1: Select proper formwork, accessories and material.
CO 2: Design the form work for conventional structural elements.
CO 3: Design the form work for Special Structures.
CO 4: Understand the working of flying formwork.
CO 5: Judge the formwork failures through case studies.
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L-Low, M-Moderate (Medium), H-High
PREREQUISITES: Nil

COURSE OBJECTIVE:
- To learn various experimental techniques and instrumentation procedure.

UNIT I - FORCE AND STRAIN MEASUREMENT
Strain Gauges, principle, types, performance and uses - Photo elasticity, principle and applications - Moiré fringes hydraulic jacks and pressure gauges - Electrical load cells - proving rings - calibration of testing machines.

UNIT II - VIBRATION MEASUREMENTS
Characteristics of structural vibration - linear variable differential transformer (LVDT) - Transducers for Velocity and acceleration measurements - vibration meter - seismographs - vibration analyzer - display of recording of signals - cathode ray oscilloscope - XY plotter - chart plotters - Digital data acquisition systems.

UNIT III - ACOUSTICS AND WIND FLOW MEASURES
Principles of pressure and flow measurements - pressure transducer - sound level meter - venturimeter and flow meters - Wind tunnel and its use in structural analysis - structural modeling - direct and indirect model analysis.

UNIT IV - DISTRESS MEASUREMENTS
Diagnosis of distress in structures - crack observation and measurement - Corrosion of reinforcement in concrete - Half cell, construction and use - damage assessment - controlled blasting for demolition.

UNIT V - NON DESTRUCTIVE TESTING METHODS
Load testing on structures, buildings, bridges and towers - Rebound hammer - Acoustic emission - Ultrasonic testing, Principles and applications - Holography - Use of laser for structural testing - Brittle coatings.

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS:
**COURSE OUTCOME:**

The students are able to,

**CO1:** Apply concepts of measurements and related instruments in the real time application areas.

**CO2:** Use various vibration measuring instruments and analyze the structures using digital display units.

**CO3:** Gain knowledge about acoustic and flow measurements.

**CO4:** Diagnosis the distress in structures using various methods.

**CO5:** Perform NDT methods in accessing the load testing of structures.

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L-Low, M-Moderate (Medium), H-High
PREREQUISITES: Nil

COURSE OBJECTIVE:
- To impart Knowledge on design of composite beams, columns, trusses and box girder bridges including the related connections.

UNIT I - FUNDAMENTALS

UNIT II - COMPOSITE SLABS AND BEAMS
Composite floor slabs - conventional composite beams - resistance to sagging bending, longitudinal shear and vertical shear – stresses in service – design examples. Continuous composite beams -Elastic and inelastic design considerations.

UNIT III - COMPOSITE COLUMNS AND FRAMES

UNIT IV - COMPOSITE TRUSSES

UNIT V - SPECIAL STRUCTURES
Steel sandwich construction- Box Girder Bridge- Case studies – seismic Behaviour- Different codal provisions - Fabrication and erection of structures including heavy structures, Prefab construction, Industrialized construction.

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS:
COURSE OUTCOME:

The students are able to,

**CO 1:** Acquire sufficient knowledge on behavior of composite structures under various loads.

**CO 2:** Select appropriate design methods for composite structures such as slabs and beams.

**CO 3:** Design the Composite columns and frames.

**CO 4:** Design the Composite trusses including connecting elements.

**CO 5:** Formulate and execute the construction sequence of special composite structures.

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L-Low, M-Moderate (Medium), H-High
PREREQUISITES: Nil

COURSE OBJECTIVE:
- To impart Knowledge on pre fabricated elements and the technologies used in fabrication and erection.

UNIT I - INTRODUCTION AND DESIGN PRINCIPLES  (9)
General Civil Engineering requirements, specific requirements for planning and I layout of prefabricates plant. IS Code specifications. Modular co-ordination, standardization, Disuniting of Prefabricates, production, transportation, erection, stages of loading and codal provisions, safety factors, material properties, Deflection control, Lateral load resistance, Location and types of shear walls.

UNIT II - REINFORCED CONCRETE  (9)
Prefabricated structures - Long wall and cross-wall large panel buildings, one way and two way prefabricated slabs, Framed buildings with partial and curtain walls, single storey industrial buildings with trusses and shells, Crane-gantry systems.

UNIT III - FLOORS, STAIRS, ROOFS AND WALLS  (9)
Types of floor slabs, analysis and design example of cored and panel types and two-way systems, staircase slab design, types of roof slabs and insulation requirements, Description of joints, their behaviour and reinforcement requirements, Deflection control for short term and long term loads, Ultimate strength calculations in shear and flexure. Types of wall panels, Blocks and large panels, Curtain, Partition and load bearing walls.

UNIT IV - DESIGN OF INDUSTRIAL BUILDINGS  (9)
Components of single -storey industrial sheds with crane gantry systems, Design of R.C. Roof Trusses, Roof Panels, Design of R.C.craney gantry girders, corbels and columns, wind bracing design.

UNIT V - DESIGN OF SHELL ROOFS FOR INDUSTRIAL SHEDS  (9)
Cylindrical, Folded plate and hyper-prefabricated shells, Erection and jointing, joint design, hand book based design.

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS:


COURSE OUTCOME:
The students are able to,

CO 1: Gain knowledge on the basics of prefabricated structure design principles.

CO 2: familiarize with the construction of Single storey industrial buildings with trusses and shells.

CO 3: Analyze the behavior of various prefabricated structural members, floors, stairs, roofs and walls.

CO 4: Design the prefabricated industrial buildings and its components.

CO 5: Design the prefabricated shell roof and its installation.

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L-Low, M-Moderate (Medium), H-High
18SEPE23 – OFFSHORE STRUCTURES

Category: PE

PREREQUISITES: Nil

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COURSE OBJECTIVE:
- To impart knowledge on forces due to ocean waves and to design off shore structures.

UNIT I - WAVE THEORIES
Wave generation process, small and finite amplitude wave theories.

UNIT II - FORCES OF OFFSHORE STRUCTURES
Wind forces, wave forces on vertical, inclined cylinders, structures - current forces and use of Morison equation.

UNIT III - OFFSHORE SOIL AND STRUCTURE MODELING
Different types of offshore structures, foundation modeling, structural modeling.

UNIT IV - ANALYSIS OF OFFSHORE STRUCTURES
Static method of analysis, foundation analysis and dynamics of offshore structures.

UNIT V - DESIGN OF OFFSHORE STRUCTURES
Design of platforms, helipads, Jacket tower and mooring cables and pipe lines.

Lecture: 45 Periods    Tutorial: 0 Periods    Practical: 0 Periods    Total: 45 Periods

REFERENCE BOOKS:

COURSE OUTCOME:
The students are able to,

CO 1: understand the basics of wave generation process and wave theories
CO 2: Analyse for the forces in off shore structures.
CO 3: Formulate the structural modeling of offshore structures.
CO 4: Demonstrate foundation modeling of offshore structures.
CO 5: Design various components of offshore structures.
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L-Low, M-Moderate (Medium), H-High
PREREQUISITES: Nil

UNIT I - CORROSION
General, electrochemical corrosion of metals, galvanic cells, corrosion rates (kinetics), types of corrosion with properties and phenomenon, oxidation metals.

UNIT II - CORROSION TESTING
Importance, classification materials and specimens, surface preparation, measuring and weighing, exposure techniques, duration, planned interval tests.

UNIT III - CORROSION PREVENTION
Material selection, modification of metal, alternate of environment, design, cathodic and anodic protection, coatings (metallic, inorganic, non metallic and organic)

UNIT IV - CORROSION IN SELECTED ENVIRONMENTS
Atmospheric Corrosion, Corrosion in Automobiles, Corrosion in Soils, Corrosion of Steel in Concrete, Corrosion in Water, Microbiologically Induced Corrosion, Corrosion in the Body

UNIT V - CORROSION IN INDUSTRIES
Corrosion in the Petroleum Industry, Corrosion in the Aircraft Industry, Corrosion in the Microelectronics Industry

Lecture: 45 Periods   Tutorial: 0 Periods   Practical: 0 Periods   Total: 45 Periods

REFERENCE BOOKS:

**COURSE OUTCOME:**
The students are able to,

**CO 1:** Understand the causes and mechanism of various types of corrosion.

**CO 2:** conduct various tests for corrosion measurement.

**CO 3:** apply suitable techniques for corrosion prevention

**CO 4:** familiarize with the occurrence of corrosion under different environment.

**CO 5:** able to identify corrosion related issues in various industries

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L-Low, M-Moderate (Medium), H-High
18SEPE25 – EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

Category: PE

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COURSE OBJECTIVE:
- To understand the causes and effects of earthquake and the structural systems subjected to earthquake forces as per the recommendations of IS code of practice.

UNIT I - INTRODUCTION
(9)

UNIT II - SEISMIC DESIGN OF BUILDINGS
(9)

UNIT III - IS CODE PROVISIONS
(9)

UNIT IV - SEISMIC DESIGN CONCEPTS
(9)

UNIT V - SPECIAL PROBLEMS AND MODERN CONCEPTS
(9)

COMPUTER AIDED ANALYSIS AND DESIGN: (For internal assessment only – not for theory examination) computer aided analysis and design of building systems for earthquake loads – response spectrum - time history analysis – capacity based design – hands on session using computer software.

Lecture: 45 Periods    Tutorial: 0 Periods    Practical: 0 Periods    Total: 45 Periods
REFERENCE BOOKS:

COURSE OUTCOME:
The students are able to,
CO 1: Understand the causes of earthquake and its measurement.
CO 2: Analyse the seismic behaviour of structures.
CO3: Acquire knowledge on codal provisions for earthquake resistant design.
CO4: Understand the concepts of earthquake resistant design and detailing.
CO 5: Gain knowledge on effects of earthquake and retrofitting of structures.

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L-Low, M-Moderate (Medium), H-High
COURSE OBJECTIVE:
- To impart knowledge on behaviour and design concepts for dynamic loads as per codal provisions and to learn about ductile detailing.

UNIT I - GENERAL
Design philosophy to resist earthquake, cyclone, flood, blast and impact - National and International codes of practice – Behavior of concrete, steel, masonry and soil under impact and cyclic loads- Energy absorption capacity – Ductility of material and the structure.

DESIGN AGAINST CYCLONE AND FLOOD: Effect of cyclones on buildings and special structures – safety and precautionary steps in design.

UNIT II - DESIGN AGAINST EARTH-QUAKES

UNIT III - DESIGN AGAINST BLAST AND IMPACT
Characteristics of internal and external blast - Impact and impulse loads- Explosions-Threats – wave scaling law – Fire loading – restraints – Pressure distribution on buildings above ground due to external blast – underground explosion - Design of buildings for blast, fire and impact as per BIS code of practice.

UNIT IV - DESIGN AGAINST WIND
Characteristics of wind – Basic and design wind speeds Aeroelastic and Aerodynamic effect - Design as per BIS code of practice including Gust factor approach-along wind and across wind response- effect on tall buildings, towers, chimneys, roofs, window glass, Cladding and slender structures - vibration of cable supported bridges and power lines due to wind effects- tornado effects.

UNIT V - SPECIAL CONSIDERATIONS

Lecture: 45 Periods    Tutorial: 0 Periods    Practical: 0 Periods    Total: 45 Periods

REFERENCE BOOKS:

COURSE OUTCOME:
The students are able to,

CO 1: Understand the effects of dynamic loads like earthquake, blast and impact on structures.

CO 2: Familiarize with the concepts of seismic resistant design.

CO 3: Design the structures against blast and impact.

CO 4: Calculate effect of wind on structures and design against wind load.

CO 5: Understand the knowledge on the concepts of favorable materials for ductility based designing of structure along with strengthening methods.

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L-Low, M-Moderate (Medium), H-High
COURSE OBJECTIVE:
- To impart knowledge on behaviour, analyze and design of tall structural systems.

UNIT I - DESIGN CRITERIA (9)
Design philosophy, Loading, Sequential loading, materials - high performance Concrete - Fiber reinforced Concrete - Light weight Concrete - Design mixes

UNIT II - LOADING AND MOVEMENT (9)

UNIT III - BEHAVIOUR OF VARIOUS STRUCTURAL SYSTEMS (9)
Factors affecting growth, Height and Structural form. High rise behaviour, Rigid frames, braced frames, Infilled frames, shear walls, coupled shear walls, wall-frames, tubulars, cores, outrigger - braced and hybrid mega system.

UNIT IV - ANALYSIS AND DESIGN (9)
Modeling for approximate analysis, Accurate analysis and reduction techniques, Analysis of building as total structural system considering overall integrity and major subsystem interaction, Analysis for member forces, drift and twist, computerized general three dimensional analysis. Structural elements : Sectional shapes, properties and resisting capacity, design, deflection, cracking, prestressing, shear flow. Design for differential movement, creep and shrinkage effects, temperature effects and fire resistance.

UNIT V - STABILITY OF TALL BUILDINGS (9)
Overall buckling analysis of frames, wall-frames, Approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first-order and P-Delta analysis, Translational, Torsional instability, out of plum effects, stiffness of member in stability, effect of foundation rotation.

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS:

COURSE OUTCOME:
The students are able to,

CO 1: Familiarize with the problems associated with the large heights of structures with respect to different loads and materials.

CO 2: Analyse the structure subjected to vertical and lateral loads.

CO 3: Understand the behaviour of high rise building with various structural elements.

CO 4: Analyze and design various structural systems for high rise buildings.

CO 5: Carryout stability analysis, overall buckling analysis of frames and analysis of various secondary effects on tall building.

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L-Low, M-Moderate (Medium), H-High
COURSE OBJECTIVE:
• To impart knowledge on design of various cold formed steel structural elements.

UNIT I - INTRODUCTION (9)

UNIT II - STRENGTH OF THIN ELEMENTS AND DESIGN CRITERIA (9)

UNIT III - DESIGN OF FLEXURAL MEMBERS (9)
General – Beam Strength and Deflection – Design of Webs of beams – Lateral Buckling of Beams – Bracing Requirements of Beams – Unusually Wide Beam Flanges and Unusually Short Span beams.

UNIT IV - DESIGN OF COMPRESSION MEMBERS (9)

UNIT V - DESIGN OF BEAM COLUMNS (9)
General – doubly symmetric shapes and shapes not subjected to torsional or torsional-flexural buckling – thin walled open Sections which may be subjected to Torsional-Flexural Buckling – Singly Symmetric Open Shapes – Unsymmetric Shapes.
Light Gauge Steel Shear Diaphragms and shell Roof Structures - light Gauge Steel Shear Diaphragms – Columns and Beams braced by Steel Diaphragms – Shell Roof Structures.

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS:

**COURSE OUTCOME:**
The students are able to,

**CO 1:** Understand the concepts on the behaviour of Cold formed steel structures.

**CO 2:** Apply the knowledge of thin elements in the design of cold formed steel.

**CO 3:** Design the cold formed steel flexural members as per codal provisions.

**CO 4:** Design the compression members as per codal provisions.

**CO 5:** Design the cold formed steel beam columns as per codal provisions.

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L-Low, M-Moderate (Medium), H-High
COURSE OBJECTIVE:
To understand the mechanism of earthquake, wave propagation analysis, ground motion, earthquake hazards, their mitigation and design of earthquake resistant foundations.

UNIT I - EARTHQUAKE SEISMOLOGY

UNIT II - GROUND MOTION AND GROUND RESPONSE ANALYSIS

UNIT III - LIQUEFACTION AND LATERAL SPREADING
Liquefaction related phenomena – Liquefaction susceptibility – Evaluation of liquefaction by Cyclic Stress and Cyclic Strain approaches – Lateral deformation and spreading – Criteria for mapping liquefaction hazard zones – Liquefaction computation from Lab and Field tests.

UNIT IV - SEISMIC DESIGN OF FOUNDATIONS, RETAINING WALLS AND SLOPES
Seismic design requirements of foundation – Seismic design of pile foundations – Seismic design of retaining walls – Behaviour of reinforced slope under seismic condition – Recommendations of seismic codes related to geotechnical engineering.

UNIT V - SEISMIC HAZARD ANALYSIS

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS:

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

**CO1**: Acquire knowledge about the earthquake ground motion, making familiar with code and software packages to study the ground motion.

**CO2**: Analyze the liquefaction susceptibility of the site using laboratory and field tests.

**CO3**: Design earthquake resistant geotechnical structures and the methods to improve the ground for hazard resistance.

**CO4**: Acquire knowledge about Seismic related codes in geotechnical engineering

**CO5**: Acquire knowledge about soil improvement for remediation of seismic hazards

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L-Low, M-Moderate (Medium), H-High
18SEOE01- VASTU SCIENCE FOR BUILDING CONSTRUCTION
(Common to All Branches)

Category: OE

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PRE-REQUISITES: Nil

COURSE OBJECTIVE:
To impart basic knowledge of vastu science and its impact on human well being.

UNIT I - INTRODUCTION
(9)
Traditional definition - Meaning of Vastu and Vaastu -its classification -Relationship to earth - concept of existence and manifestation – planatory influence on earth.

UNIT II - SPACE THEORY IN VASTU
(9)
Features of good building site -good building shapes -macro, micro, enclosed and material spaces - relationship between built space, living organism and universe -impact of built space on human psyche. Flow of energy within built space and outside - zoning of functional areas -fitting of components in the building -significance of water bodies and energy -The cube as the basic structure.

UNIT III - COSMOGRAM & SETTLEMENT CONCEPTS
(9)
Orientation of building, site, layout and settlement -positive and negative energies -importance of cardinal and ordinal directions -The celestial grid or-mandala and its type. The Vaastu Purusha Mandala and its significance in creation of patterns, and lay-outs, extension of this to aural and visual fields -Types of Lay-Outs

UNIT IV - INTERFACE OF TIME, VIBRATION AND RHYTHM
(9)
Theory of vibration and energy transfer – equation of time and space – manifestation in living organism – human beings – measurement of the energy– Kiritian energy of various forms-documentation of objects – filaments and streamers.

UNIT V - MEASUREMENTS & MATERIALS
(9)
Units of measurement -Mana shastra -Ayadi techniques - Tala system and Hasta system of measures -Musical measurements compared to space measurements -resultant ambience in built space. Use of wood, stone, metal, brick and time- making technology, corbelling technology, jointing technology -foundations for heavy and light structures -Landscaping in and around buildings -Aesthetic in Indian Architecture.

Lecture: 45 Periods    Tutorial: 0 Periods    Practical: 0 Periods    Total: 45 Periods
REFERENCE BOOKS:
1. Dr. Prasanna Kumar Acharya–“Manasara” - Oxford University Press 1927 - (English version)

COURSE OUTCOMES:
The students are able to
CO 1: Obtain exposure on various concepts of vastu
CO 2: Understand the theories in Vastu.
CO 3: familiarize with the Cosmogram and settlement concepts of vastu
CO 4: Understand the role of vasthu in energy flow manifestation in living beings.
CO 5: Plan a structure considering various vastu techniques.

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L-Low, M-Moderate (Medium), H-High
18SEOE02 - PLANNING OF SMART CITIES
(Common to All Branches)

PRE-REQUISITES: Nil

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Category: OE

COURSE OBJECTIVE:
To have an exposure on development of smart cities considering various fields related and their challenges.

UNIT I – SMART CITIES DEVELOPMENT POTENTIALS AND CHALLENGES

Perspectives of Smart Cities: Introduction and Overview - Implementation Challenges - Methodological issues - Spatial distribution of start up cities – Re imagining post industrial cities - Implementation Challenges for Establishing Smart Urban Information and Knowledge Management System

UNIT II – ROLE OF ICT, REMOTE SENSING, AND GEOGRAPHICAL INFORMATION SYSTEM


UNIT III – ENVIRONMENT, ENERGY, DISASTER MANAGEMENT AND SUSTAINABLE DEVELOPMENT


UNIT IV – MULTIFARIOUS MANAGEMENT FOR SMART CITIES


UNIT V – INTELLIGENT TRANSPORT SYSTEM


Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods
REFERENCE BOOKS:
1. Poonam Sharma, Swati Rajput, “Sustainable Smart Cities in India_ Challenges and Future Perspectives” Springer 2017 Co.(P) Ltd. 2013
2. Ivan Nunes Da Silva, “Rogerio Andrade Flauzino-Smart Cities Technologies-ExLi4EvA” (2016)

COURSE OUTCOME:
CO 1: Identify the potential and challenges in smart city development.
CO 2: Apply the different tools for sustainable urban planning.
CO 3: Understand the concepts of environment, energy and disaster management.
CO 4: Identify the proper methods for water and waste water management.
CO 5: Familiarize with the intelligent transport systems.

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L-Low, M-Moderate (Medium), H-High
18SEO03 - GREEN BUILDING
(Common to All Branches)

PRE-REQUISITES: Nil

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COURSE OBJECTIVE:
- To introduce the different concepts of sustainable design and green building techniques and how they may be synthesized to best fit a specific construction project.

UNIT I - INTRODUCTION

UNIT II - ENERGY EFFICIENT BUILDINGS
Passive cooling and day lighting – Active solar and photovoltaic- Building energy analysis methods- Building energy simulation- Building energy efficiency standards- Lighting system design- Lighting economics and aesthetics- Impacts of lighting efficiency – Energy audit and energy targeting- Technological options for energy management.

UNIT III - INDOOR ENVIRONMENTAL QUALITY MANAGEMENT

UNIT IV - GREEN BUILDING CONCEPTS
Green building concept- Green building rating tools- Leeds and IGBC codes. – Material selection Embodied energy- Operating energy- Façade systems- Ventilation systems- Transportation- Water treatment systems- Water efficiency- Building economics

UNIT V - GREEN BUILDING DESIGN CASE STUDY
Students to work through a controlled process of analysis and design to produce drawings and models of their own personal green building project. Topics include building form, orientation and site considerations; conservation measures; energy modeling; heating system and fuel choices; renewable energy systems; material choices; and construction budget-Case Study on green construction and design.

Lecture: 45 Periods    Tutorial: 0 Periods    Practical: 0 Periods    Total: 45 Periods
REFERENCE BOOKS:
4. Energy Conservation Building Codes: www.bee-india.nic.in

COURSE OUTCOMES:
The students are able to
CO 1: Describe the concepts of sustainable design
CO 2: Familiarize with green building techniques including energy efficiency management.
CO 3: Understand the indoor environmental quality management in green building.
CO 4: Perform the green building rating using various tools.
CO 5: Create drawings and models of their own personal green building project.

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L-Low, M-Moderate (Medium), H-High
PREREQUISITES: Nil

COURSE OBJECTIVES:

On completion of this course the students are able to:
1. Get knowledge about occupational health hazard and safety measures at work place
2. Learn about accident prevention and safety management
3. Learn about general safety measures in industries

UNIT I OCCUPATIONAL HEALTH AND HAZARDS (8)
Occupation, Health and Hazards - Safety Health and Management: Occupational Health Hazards - Ergonomics - Importance of Industrial Safety Radiation and Industrial Hazards: Types and effects - Vibration - Industrial Hygiene - Different air pollutants in industries and their effects Electrical, fire and Other Hazards - General causes, Machine Guards and its types, Automation.

UNIT II SAFETY A WORKPLACE (10)

UNIT III ACCIDENT PREVENTION (9)

UNIT IV SAFETY MANAGEMENT (9)

UNIT V GENERAL SAFETY MEASURES (9)

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total 45 Periods
**REFERENCE BOOKS:**

3. Industrial Safety - National Council of India
4. Factories Act with Amendments 1987, Govt. of India Publications DGFASLI, Mumbai

**COURSE OUTCOMES:**

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

**CO1:** Gain the knowledge about occupational health hazard and safety measures at work place

**CO2:** be Able to learn about accident prevention and safety management

**CO3:** Understand occupational health hazards and general safety measures in industries

**CO4:** Got to know various laws, standards and legislations.

**CO5:** Able to learn about safety and proper management of industries

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L-Low, M-Moderate(Medium), H-High
PREREQUISITES: Nil

COURSE OBJECTIVES:

On completion of this course the students are able to:

1. Able to get knowledge about Climate system and its changes and causes
2. Able to learn about impacts, adaptation and mitigation of climate change
3. Able to learn about clean technology and clean energy

UNIT I  EARTH'S CLIMATE SYSTEM  (09)


UNIT II  OBSERVED CHANGES AND ITS CAUSES  (09)


UNIT III  IMPACTS OF CLIMATE CHANGE  (09)


UNIT IV  CLIMATE CHANGE ADAPTATION AND MITIGATION MEASURES  (09)


Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS:
2. IPCC fourth assessment report - The AR4 synthesis report, 2007

COURSE OUTCOMES:
At the end of the course the student will be able:
CO1: To understand the climatic system and the factors influencing the climatic changes
CO2: To assess the uncertainty and impact of climatic changes
CO3: To develop strategies for adaptation and mitigation of climatic changes
CO4: To identify clean technologies for sustainable growth
CO5: To identify clean technologies for sustainable growth

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L-Low,  M-Moderate(Medium), H-High
PREREQUISITES: Nil

COURSE OBJECTIVES:

On completion of this course the students are able to:

- Able to get knowledge about the utilization of waste and its purpose.

UNIT I INTRODUCTION

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

UNIT II BIOMASS PYROLYSIS


UNIT III BIOMASS GASIFICATION


UNIT IV BIOMASS COMBUSTION

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

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

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total  45 Periods
REFERENCE BOOKS:


COURSE OUTCOMES:

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

CO1: Understand solid waste management techniques

CO2: Know what is biomass

CO3: Study Methods and factors considered for biomass gasification

CO4: Know equipment meant for biomass combustion

CO5: Understand about biogas and its development in India

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L-Low, M-Moderate (Medium), H-High
18GEOE07 - ENERGY IN BUILT ENVIRONMENT
(Common to All Branches)

Category: OE

COURSE OBJECTIVES:

On completion of this course students are able to:
1. About energy use and its management
2. Understand constructional requirements of buildings
3. Know relationship of energy and environment

UNIT I INTRODUCTION

(09)


UNIT II LIGHTING REQUIREMENTS IN BUILDING

(09)

The sun-earth relationship - Climate, wind, solar radiation and temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings – Lighting and day lighting: Characteristics and estimation, methods of day-lighting – Architectural considerations for day-lighting

UNIT III ENERGY REQUIREMENTS IN BUILDING

(09)

Steady and unsteady heat transfer through wall and glazed window - Standards for thermal performance of building envelope - Evaluation of the overall thermal transfer - Thermal gain and net heat gain - End-use energy requirements - Status of energy use in buildings - Estimation of energy use in a building

UNIT IV ENERGY AUDIT

(09)

Energy audit and energy targeting - Technological options for energy management - Natural and forced ventilation – Indoor environment and air quality - Airflow and air pressure on buildings - Flow due to stack effect

UNIT V COOLING IN BUILT ENVIRONMENT

(09)


Lecture: 45 Periods   Tutorial: 0 Periods   Practical: 0 Periods   Total: 45 Periods
REFERENCE BOOKS:

5. Reference Manuals of DOE-2 (1990), Orlando Lawrence-Berkeley Laboratory, University of California, and Blast, University of Illinois, USA.

COURSE OUTCOMES:

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

| CO1 | Understand energy and its usage |
| CO2 | To know lighting to be given to a building |
| CO3 | To study energy requirements in a building |
| CO4 | Understand energy audit |
| CO5 | To study architectural specifications of a building |

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L-Low, M-Moderate(Medium), H-High
COURSE OBJECTIVE

To know about the planet earth, the geosystems and the resources like ground water and air and to learn about the Environmental Assessment and sustainability.

UNIT I - EVOLUTION OF EARTH (09)
Evolution of earth as habitable planet - Evolution of continents - oceans and landforms - evolution of life through geological times - Exploring the earth’s interior - thermal and chemical structure - origin of gravitational and magnetic fields.

UNIT II - GEOSYSTEMS (09)

UNIT III - GROUND WATER GEOLOGY (09)

UNIT IV - ENVIRONMENTAL ASSESSMENT AND SUSTAINABILITY (09)
Engineering and sustainable development - population and urbanization - toxic chemicals and finite resources - water scarcity and conflict - Environmental risk - risk assessment and characterization - hazard assessment - exposure assessment.

UNIT V - AIR AND SOLIDWASTE (09)

Lecture: 45 periods  Tutorial:0 Periods  Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS:
COURSE OUTCOMES
At the end of the course, students will be able to

CO1: Know about evolution of earth and the structure of the earth.
CO2: Understand the internal Geosystems like earthquakes and volcanoes and the various geological processes.
CO3: Understand the geological process of occurrence and movement of groundwater and the modeling systems.
CO4: Assess the Environmental risks and the sustainability developments.
CO5: Learn about the photochemistry of atmosphere and the solid waste management concepts.

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L-Low, M-Moderate(Medium), H-High
18GEOE09 - NATURAL HAZARDS AND MITIGATION
(Common to All Branches)

PREREQUISITES: Nil

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COURSE OBJECTIVE

To get idea about the various natural hazards like Earthquakes, slope stability, floods, droughts and Tsunami and the mitigation measures.

UNIT I - EARTHQUAKES

Definitions and basic concepts - different kinds of hazards – causes - Geologic Hazards – Earthquakes - causes of earthquakes – effects - plate tectonics - seismic waves - measures of size of earthquakes - earthquake resistant design concepts.

UNIT II - SLOPE STABILITY

Slope instability and landslides - causes of landslides - principles of stability analysis - remedial and corrective measures for slope stabilization.

UNIT III - FLOODS

Climatic Hazards – Floods - causes of flooding - regional flood frequency analysis - flood control measures - flood routing - flood forecasting - warning systems.

UNIT IV - DROUGHTS


UNIT V - TSUNAMI


Lecture: 45 periods  Tutorial:0 Periods  Practical: 0 Periods Total: 45 Periods

REFERENCE BOOKS:
COURSE OUTCOMES
At the end of the course, students will be able to

**CO1**: Understand the basic concepts of earthquakes and the design concepts of earthquake resistant buildings.

**CO2**: Acquire knowledge about the causes and remedial measures of slope stabilization.

**CO3**: Gain knowledge about the causes and control measures of flood.

**CO4**: Understand the types, causes and mitigation of droughts.

**CO5**: Know the causes, effects and precautionary measures of Tsunami.

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PREREQUISITES: Nil

COURSE OBJECTIVE:
- Understand the role of business analytics within an organization.
- Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

UNIT I - BUSINESS ANALYTICS AND PROCESS


UNIT II - REGRESSION ANALYSIS


UNIT III - STRUCTURE OF BUSINESS ANALYTICS

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

UNIT IV - FORECASTING TECHNIQUES


UNIT V - DECISION ANALYSIS AND RECENT TRENDS IN BUSINESS ANALYTICS


Lecture: 45 Periods    Tutorial: 0 Periods    Practical: 0 Periods    Total: 45 Periods
REFERENCE BOOKS:

COURSE OUTCOMES:
On completion of this course, students will be able to
CO1: Students will demonstrate knowledge of data analytics.
CO2: Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
CO3: Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.

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L-Low, M-Moderate (Medium), H-High
18EDOE11-COST MANAGEMENT OF ENGINEERING PROJECTS
(Common to All Branches)

PREREQUISITES : Nil

COURSE OBJECTIVE :
- To be familiar with cost management and project planning.
- To acquire knowledge of decision making, price strategies and total quality management tools.

UNIT I - INTRODUCTION TO COST MANAGEMENT

UNIT II - PROJECT PLANNING ACTIVITIES
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 nontechnical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process.

UNIT III - COST ANALYSIS
Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis.

UNIT IV - PRICING STRATEGIES AND BUDGETORY CONTROL

UNIT V - TQM AND OPERATIONS RESEARCH TOOLS

Lecture : 45 Periods   Tutorial : 0 Periods   Practical : 0 Periods   Total : 45 Periods
REFERENCE BOOKS:
2. Charles T. Horngren and George Foster, “Advanced Management Accounting”.

COURSE OUTCOMES:
On completion of this course, students will be able to
CO1: Understanding methods concepts of cost management.
CO2: Developing the skills for project planning.
CO3: Evaluating the cost behavior and profit.

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L-Low, M-Moderate (Medium), H-High
18EDOE12-INTRODUCTION TO INDUSTRIAL ENGINEERING
(Common to All Branches)

Category: OE
L 3 0 0 3

PREREQUISITES : Nil

COURSE OBJECTIVE :
- The objective of this course is to provide foundation in Industrial Engineering in order to enable the students to make significant contributions for improvements in different organisations.

UNIT I - INTRODUCTION


UNIT II - PLANT LOCATION AND LAYOUT


UNIT III - WORK SYSTEM DESIGN


UNIT IV - STATISTICAL QUALITY CONTROL


UNIT V - PRODUCTION PLANNING AND CONTROL


Lecture: 45 Periods     Tutorial: 0 Periods     Practical: 0 Periods     Total: 45 Periods
REFERENCE BOOKS:

COURSE OUTCOMES:
On completion of this course, students will be able to
CO1: Understanding the functioning of various kinds of Industries.
CO2: Developing the knowledge in plant location layout and work system design.
CO3: Evaluating the cost optimization in industries.

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L-Low, M-Moderate (Medium), H-High
18MFOE13 INDUSTRIAL SAFETY
(Common to All Branches)

Category: OE

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PREREQUISITES: Nil

COURSE OBJECTIVES:
- To be familiar with industrial safety equipments and techniques.
- To acquire practical knowledge of maintenance techniques available in industry.

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

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

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods
REFERENCE BOOKS:

COURSE OUTCOMES:
On completion of this course, students will be able to
CO1: Understand types of industrial safety equipments and techniques available.
CO2: Acquire practical knowledge of maintenance techniques available in industry.
CO3: Acquire knowledge on fault tracing techniques in industrial safety.

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L – Low, M – Moderate (Medium), H – High
PREREQUISITES : Nil

COURSE OBJECTIVE :
- To familiarize students with the basic concepts, models and statements of the operations research theory.

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

UNIT- II LINEAR PROGRAMMING PROBLEM
Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

UNIT-III NON LINEAR PROGRAMMING PROBLEM
Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

UNIT-IV SEQUENCING AND INVENTORY MODEL
Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

UNIT-V GAME THEORY
Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

Contact Periods:
Lecture: 45 Periods   Tutorial: 0 Periods   Practical: 0 Periods   Total: 45 Periods

REFERENCE BOOKS:
COURSE OUTCOMES:
On completion of this course, students will be able to
CO1: Apply basic theoretical principles in optimization and formulate the optimization models.
CO2: Develop mathematical skills to analyse and solve integer programming, network models arising from a wide range of industrial applications.
CO3: Implement optimization techniques in engineering problems.

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L – Low, M – Moderate (Medium), H – High
18MFOE15 - COMPOSITE MATERIALS
(Common to All Branches)

Category: OE
L T P C
3 0 0 3

PREREQUISITES : Nil

COURSE OBJECTIVES :
- To be familiar with composite materials and their advantages, applications.
- To acquire knowledge of reinforcement, manufacturing and strength analysis of composites.

UNIT- I INTRODUCTION

UNIT- II REINFORCEMENT

UNIT- III MANUFACTURING OF METAL MATRIX COMPOSITES

UNIT- IV MANUFACTURING OF POLYMER MATRIX COMPOSITE

UNIT-V STRENGTH ANALYSIS OF COMPOSITES
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.

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods
REFERENCE BOOKS:

COURSE OUTCOMES:
On completion of this course, students will be able to
CO1: Understand the nature of composite materials and composite reinforcements.
CO2: Develop the skills for manufacturing of composites.
CO3: Evaluate the strength of composite materials.

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18TEOE16 – GLOBAL WARMING SCIENCE
(Common to All Branches)

Category : OE
L T P C
3 0 0 3

PREREQUISITES: Nil

COURSE OBJECTIVES:

- To make the students to learn about the material consequences of climate change, sea level change due to increase in the emission of greenhouse gases and to examine the science behind mitigation and adaptation proposals.

UNIT I - INTRODUCTION
Terminology relating to atmospheric particles – Aerosols-types, characteristics, measurements – Particle mass spectrometry. Anthropogenic-sources, effects on humans.

UNIT II - CLIMATE MODELS

UNIT III - EARTH CARBON CYCLE AND FORECAST

UNIT IV - GREEN HOUSE GASES
Blackbody Radiation, Layer model, Earth’s atmospheric composition and Green house gases effects on weather and climate. Radiative equilibrium. Earth’s energy balance.

UNIT V - GEO ENGINEERING
Solar mitigation, Strategies – Carbon dioxide removal, solar radiation management, Recent observed trends in global warming for sea level rise, drought, glacier extent.

Lecture: 45 Periods       Tutorial: 0 Periods       Practical: 0 Periods       Total: 45 Periods
REFERENCE BOOKS:


COURSE OUTCOMES:
On completion of this course, the students will be able to:

**CO1**: Understand the current warming in relation to climate changes throughout the Earth.

**CO2**: Assess the best predictions of current climate models.

**CO3**: Able to know about current issues, including impact from society, environment, economy as well as ecology related to greenhouse gases.

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L – Low, M – Moderate (Medium), H – High
INTRODUCTION TO NANO ELECTRONICS
(Common to All Branches)

Category : OE  
L  T  P  C  
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PREREQUISITES: Nil

COURSE OBJECTIVES:
- To make the students to provide strong, essential, important methods and foundations of quantum mechanics and apply quantum mechanics on engineering fields.

UNIT I - INTRODUCTION
(9)

UNIT II - ELECTRONIC STRUCTURE AND MOTION
(9)

UNIT III - SCATTERING THEORY
(9)
The formulation of scattering events- scattering cross section, stationary scattering state. Partial wave stationary scattering events, Multi-channel scattering, Solution for Schrodinger Equation- radial and wave equation, Greens’ function.

UNIT IV - CLASSICAL STATISTICS
(9)
Probabilities and microscopic behaviors, Kinetic theory and transport processes in gases, Magnetic properties of materials, The partition function.

UNIT V - QUANTUM STATISTICS
Statistical mechanics- Basic Concepts, Statistical models applied to metals and semiconductors. The thermal properties of solids- The electrical properties of materials. Black body radiation, Low temperatures and degenerate systems.

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods
REFERENCE BOOKS:


COURSE OUTCOMES:

On completion of this course, students will be able to:

**CO1**: The student should be familiar with certain nanoelectronic systems and building blocks such as: low-dimensional semiconductors, heterostructures.

**CO2**: The student should be able to set up and solve the Schrödinger equation for different types of potentials in one dimension as well as in 2 or 3 dimensions for specific cases.

**CO3**: Potentially be able to join a research group in nanoscience/nanotechnology as a student researcher.

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L – Low, M – Moderate (Medium), H – High
18TEOE18 – GREEN SUPPLY CHAIN MANAGEMENT  
(Common to All Branches)  

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PREREQUISITES: Nil  

COURSE OBJECTIVES:  
- To make the students to learn and focus on the fundamental strategies, tools and techniques required to analyze and design environmentally sustainable supply chain systems.  

UNIT I - INTRODUCTION (9)  
Logistics – aim, activities, importance, progress, current trends. Integrating logistics with an organization.  

UNIT II - ESSENTIALS OF SUPPLY CHAIN MANAGEMENT (9)  
Basic concepts of supply chain management, Supply chain operations – Planning and sourcing, Making and delivering. Supply chain coordination and use of Technology. Developing supply chain systems.  

UNIT III - PLANNING THE SUPPLY CHAIN (9)  
Types of decisions – strategic, tactical, operational. Logistics strategies, implementing the strategy. Planning resources – types, capacity, schedule, controlling material flow, measuring and improving performance.  

UNIT IV - ACTIVITIES IN THE SUPPLY CHAIN  

UNIT V - SUPPLY CHAIN MANAGEMENT STRATEGIES  
Five key configuration components, Four criteria of a good supply chain strategies, Next generation strategies- New roles for end to end supply chain management. Evolution of supply chain organization.  

Lecture: 45 Periods    Tutorial: 0 Periods    Practical: 0 Periods    Total: 45 Periods  

REFERENCE BOOKS:  

COURSE OUTCOMES:
On completion of this course, students will be able to:
CO1: Evaluate complex qualitative and quantitative data to support strategic and operational decisions.
CO2: Develop self-leadership strategies to enhance personal and professional effectiveness.
CO3: The importance of the design and redesign of a supply chain as key components of an organization’s strategic plan.

COURSE ARTICULATION MATRIX

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L – Low, M – Moderate (Medium), H – High
18PSOE19 - DISTRIBUTION AUTOMATION SYSTEM
(Common to all Branches)

PREREQUISITES: Nil

COURSE OBJECTIVE:
To study about the distributed automation and economic evaluation schemes of power network

UNIT-I INTRODUCTION
Introduction to Distribution Automation (DA) - Control system interfaces- Control and data requirements- Centralized (vs) decentralized control- DA system-DA hardware-DAS software.

UNIT-II DISTRIBUTION AUTOMATION FUNCTIONS

UNIT-III COMMUNICATION SYSTEMS
Communication requirements - reliability- Cost effectiveness- Data requirements- Two way capability- Communication during outages and faults - Ease of operation and maintenance- Conforming to the architecture of flow. Distribution line carrier- Ripple control-Zero crossing technique- Telephone, cableTV, radio, AM broadcast, FM SCA,VHF radio, microwave satellite, fiber optics-Hybrid communication systems used in field tests.

UNIT-IV ECONOMIC EVALUATION METHODS
Development and evaluation of alternate plans- select study area – Select study period- Project load growth-Develop alternatives- Calculate operating and maintenance costs-Evaluate alternatives.

UNIT-V ECONOMIC COMPARISON
Economic comparison of alternate plans-Classification of expenses - capital expenditures- Comparison of revenue requirements of alternative plans-Book life and continuing plant analysis- Year by year revenue requirement analysis, Short term analysis- End of study adjustment-Break even analysis, sensitivity analysis - Computational aids.

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCE BOOKS:

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:

**CO1**: Analyse the requirements of distributed automation

**CO2**: Know the functions of distributed automation

**CO3**: Perform detailed analysis of communication systems for distributed automation.

**CO4**: Study the economic evaluation method

**CO5**: Understand the comparison of alternate plans

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L – Low, M – Moderate (Medium), H - High
COURSE OBJECTIVE:

To identify, analyze and create solutions for the power quality problems in power system networks.

UNIT-I : INTRODUCTION
Importance of power quality - Terms and definitions as per IEEE std.1159 for transients, short and long duration voltage variations, interruptions, short and long voltage fluctuations, imbalance, flickers - Symptoms of poor power quality- Definitions and terminology of grounding- Purpose of groundings- Good grounding practices - problems due to poor grounding.

UNIT-II : FLICKERS AND TRANSIENT VOLTAGES
RMS voltage variations in power system, complex power, voltage regulation and per unit system - Basic power flow and voltage drop - Devices for voltage regulation and impact of reactive power management - Causes and effects of voltage flicker - Short term and long term flickers -Methods to reduce flickers- Transient over voltages, impulsive transients, switching transients - Effect of surge impedance and line termination - control of transient voltages.

UNIT-III : VOLTAGE INTERRUPTIONS
Definitions -Voltage sags versus interruptions - Economic impact, Major causes and consequences -characteristics, assessment, Influence of fault location and fault level on voltage sag - Areas of vulnerability, Assessment of equipment sensitivity, Voltage sag limits for computer equipment- CBEMA, ITIC, SEMI F 42curves, Report of voltage sag analysis, Voltage sag indices, Mitigation measures for voltage sag- DSTATCOM, UPQC,UPS, DVR, SMEs, CVT, utility solutions and end user solutions.

UNIT-IV : WAVEFORM DISTORTION
UNIT-V : ANALYSIS AND CONVENTIONAL MITIGATION METHODS

Analysis of power outages, Analysis of unbalance condition: Symmetrical components inphasor quantities, Instantaneous symmetrical components, Instantaneous real and reactive powers - Analysis of distortion: On–line extraction of fundamental sequence components from measured samples – Harmonic indices – Analysis of voltage sag: Detorit Edison sag score, Voltage sag energy, Voltage Sag Lost Energy Index (VSLEI)- Analysis of voltage flicker, Reduced duration and customer impact of outages, Classical load balancing problem: Open loop balancing, Closed loop balancing, current balancing, Harmonic reduction, Voltage sag reduction.

Lecture: 45 Periods     Tutorial: 0 Periods     Practical: 0 Periods     Total: 45 Periods

REFERENCE BOOKS:
6. IEEE Std. 519-1992/ IEEE Std. 1159 IEEE recommended practices and requirements for harmonics control in electrical power system.

COURSE OUTCOMES:
CO1: Acquire knowledge about the power quality issues and standards like IEEE,IEC on voltage, Frequency and harmonics.
CO2: Recognize the practical issues in the power system
CO3: Analyze the impact of power electronic devices and techniques in power system
CO4: Develop trouble shooting skills and innovative remedies for various power quality problems in power system

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L – Low, M – Moderate (Medium), H- High
PREREQUISITES: Nil

COURSE OBJECTIVE:
To expose the students with theory and applications of Automotive Electrical and Electronic Systems.

UNIT-I : INTRODUCTION TO MODERN AUTOMOTIVE ELECTRONICS (08)
Introduction to modern automotive systems and need for electronics in automobiles- Role of electronics and microcontrollers- Sensors and actuators- Possibilities and challenges in automotive industry- Enabling technologies and industry trends.

UNIT-II : SENSORS AND ACTUATORS (09)

UNIT-III : POWER TRAIN CONTROL SYSTEMS IN AUTOMOBILE (09)
Electronic Transmission Control - Digital engine control system: Open loop and close loop control systems- Engine cooling and warm up control- Acceleration- Detonation and idle speed control - Exhaust emission control engineering- Onboard diagnostics- Future automotive power train

UNIT-IV : SAFETY, COMFORT AND CONVENIENCE SYSTEMS (10)
Cruise Control- Anti-lock Braking Control- Traction and Stability control- Airbag control system- Suspension control- Steering control- HVAC Control.

UNIT-V : ELECTRONIC CONTROL UNITS (ECU) (09)
Need for ECUs- Advances in ECUs for automotives - Design complexities of ECUs- V-Model for Automotive ECU’s- Architecture of an advanced microcontroller (XC166 Family, 32-bit Tricore) used in the design of automobile ECUs- On chip peripherals, protocol interfaces, analog and digital interfaces.

Lecture: 45 Periods     Tutorial: 0 Periods     Practical: 0 Periods     Total: 45 Periods
REFERENCE BOOKS:

6. IEEE Std. 519-1992/ IEEE Std. 1159 IEEE recommended practices and requirements for harmonics control in electrical power system.

COURSE OUTCOMES:
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PREREQUISITES: Nil

COURSE OBJECTIVE:
To comprehend the Virtual instrument action programming concepts towards measurements and control.

UNIT-I : INTRODUCTION
Introduction - advantages - Block diagram and architecture of a virtual instrument - Conventional Instruments versus Traditional Instruments - Data-flow techniques, graphical programming in data flow, comparison with conventional programming.

UNIT-II : GRAPHICAL PROGRAMMING AND LabVIEW
Concepts of graphical programming - LabVIEW software - Concept of VIs and sub VI - Display types - Digital - Analog - Chart and Graphs. Loops - structures - Arrays – Clusters- Local and global variables – String - Timers and dialog controls.

UNIT-III : VI MANAGING FILES & DESIGN PATTERNS
High-level and low-level file I/O functions available in LabVIEW – Implementing File I/O functions to read and write data to files – Binary Files – TDMS – sequential programming – State machine programming – Communication between parallel loops –Race conditions – Notifiers & Queues – Producer Consumer design patterns

UNIT-IV : PC BASED DATA ACQUISITION
Introduction to data acquisition on PC, Sampling fundamentals, ADCs, DACs, Calibration, Resolution, - analog inputs and outputs - Single-ended and differential inputs - Digital I/O, counters and timers, DMA, Data acquisition interface requirements - Issues involved in selection of Data acquisition cards - Use of timer-counter and analog outputs on the universal DAQ card.

UNIT-V : DATA AQUISTION AND SIGNAL CONDITIONING

Lecture: 45 Periods     Tutorial: 0 Periods     Practical: 0 Periods     Total: 45 Periods

REFERENCE BOOKS:

COURSE OUTCOMES:

CO1: Gain Knowledge of graphical programming techniques using LabVIEW software.
CO2: Explore the basics of programming and interfacing using related hardware.
CO3: Outline the aspects and utilization of PC based data acquisition and Instrument interfaces
CO4: Create programs and Select proper instrument interface for a specific application

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PREREQUISITES: Nil

COURSE OBJECTIVE:
To Comprehend energy management schemes and perform economic analysis and load management in electrical systems.

UNIT-I : BASICS OF ENERGY MANAGEMENT (09)

UNIT-II : ACTION PLANNING AND MONITORING (09)

UNIT-III : STUDY OF THERMAL UTILITIES (09)

UNIT-IV : STUDY OF ELECTRICAL UTILITIES (09)

UNIT-V : ENERGY ASSESSMENT IN UTILITY SYSTEMS (09)

Lecture: 45 Periods   Tutorial: 0 Periods   Practical: 0 Periods   Total: 45 Periods
REFERENCE BOOKS:


COURSE OUTCOMES:

**CO1**: Possess knowledge on energy management.

**CO2**: Analyze the feature of energy audit methodology and documentation of report.

**CO3**: Able to plan energy management action and develop the understanding of implementation.

**CO4**: Familiarize with thermal utilities.

**CO5**: Familiarize with electrical utilities.

**CO6**: Perform assessment of different systems.

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PREREQUISITES: Nil

COURSE OBJECTIVES:
To explore the fundamentals, technologies and applications of energy storage.

UNIT-I : ENERGY STORAGE: HISTORICAL PERSPECTIVE, (09)
INTRODUCTION AND CHANGES

UNIT-II : TECHNICAL METHODS OF STORAGE (09)
Introduction: Energy and Energy Transformations, Potential energy (pumped hydro, compressed air, springs)- Kinetic energy (mechanical flywheels)- Thermal energy without phase change passive (adobe) and active (water)-Thermal energy with phase change (ice, molten salts, steam)- Chemical energy (hydrogen, methane, gasoline, coal, oil)- Electrochemical energy (batteries, fuel cells)- Electrostatic energy (capacitors), Electromagnetic energy (superconducting magnets)- Different Types of Energy Storage Systems.

UNIT-III PERFORMANCE FACTORS OF ENERGY STORAGE SYSTEMS (09)
Energy capture rate and efficiency- Discharge rate and efficiency- Dispatch ability and load flowing characteristics, scale flexibility, durability – Cycle lifetime, mass and safety – Risks of fire, explosion, toxicity- Ease of materials, recycling and recovery- Environmental consideration and recycling , Merits and demerits of different types of Storage.

UNIT-IV : APPLICATION CONSIDERATION (09)

UNIT-V : HYDROGEN FUEL CELLS AND FLOW BATTERIES (09)

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods
REFERENCE BOOKS:


COURSE OUTCOMES:

CO1: Recollect the historical perspective and technical methods of energy storage.

CO2: Learn the basics of different storage methods.

CO3: Determine the performance factors of energy storage systems.

CO4: Identify applications for renewable energy systems.

CO5: Understand the basics of Hydrogen cell and flow batteries.

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L – Low,  M – Moderate (Medium),  H - High
PREREQUISITES: Nil

COURSE OBJECTIVES:

- Design synchronous and asynchronous sequential circuits
- Develop VHDL code for digital circuits
- Implementation in PLDs
- Fault diagnosis

SYNCHRONOUS SEQUENTIAL CIRCUIT DESIGN
Analysis of Clocked Synchronous Sequential Circuits - Modeling, state table reduction, state assignment, Design of Synchronous Sequential Networks, Design of iterative circuits - ASM chart - ASM realization.

ASYNCHRONOUS SEQUENTIAL CIRCUIT DESIGN
Analysis of Asynchronous Sequential Circuits - Races in ASC – Primitive Flow Table - Flow Table Reduction Techniques, State Assignment Problem and the Transition Table – Design of ASC – Static and Dynamic Hazards – Essential Hazards – Data Synchronizers.

SYSTEM DESIGN USING PLDS
Basic concepts – Programming Technologies - Programmable Logic Element (PLE) - Programmable Array Logic (PLA) - Programmable Array Logic (PAL) –Design of combinational and sequential circuits using PLDs – Complex PLDs (CPLDs)

INTRODUCTION TO VHDL

LOGIC CIRCUIT TESTING AND TESTABLE DESIGN
Digital logic circuit testing - Fault models - Combinational logic circuit testing - Sequential logic circuit testing-Design for Testability - Built-in Self-test, Board and System Level Boundary Scan. Case Study: Traffic Light Controller

REFERENCE BOOKS:

18AEOE25 - DESIGN OF DIGITAL SYSTEMS
(Common to all Branches)

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COURSE OUTCOMES:
Upon completion of the course the students will be able to:
CO1: Design synchronous and asynchronous sequential circuits based on specifications
CO2: Develop algorithm and VHDL code for design of digital circuits
CO3: Illustrate digital design implementation on PLDs.

COURSE ARTICULATION MATRIX:

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L – Low, M – Moderate (Medium), H- High
18AEOE26 ADVANCED PROCESSORS  
(Common to all Branches)

PREREQUISITES: Nil

COURSE OBJECTIVES:

- To introduce the basics of CISC and RISC
- Describe the architectural features of Pentium processors
- Describe ARM and Special processors

MICROPROCESSOR ARCHITECTURE  

HIGH PERFORMANCE CISC ARCHITECTURE – PENTIUM  

HIGH PERFORMANCE CISC ARCHITECTURE – PENTIUM INTERFACE  

HIGH PERFORMANCE RISC ARCHITECTURE: ARM  

SPECIAL PURPOSE PROCESSORS  

Lecture: 45 Periods   Tutorial: 0 Periods   Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS:

**COURSE OUTCOMES:**
Upon completion of the course the students will be able to:

**CO1:** Distinguish between RISC and CISC generic architectures.

**CO2:** Describe the architectural features of Pentium processors

**CO3:** Develop simple applications using ARM processors

**COURSE ARTICULATION MATRIX:**

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L – Low,  M – Moderate (Medium),  H- High
18AEOE27 PATTERN RECOGNITION  
(Common to all Branches)

PREREQUISITES: Nil  

3 0 0 3

COURSE OBJECTIVES:
- To get knowledge in pattern recognition in computer vision techniques
- To get knowledge in structural pattern methods
- To get knowledge on neural networks and fuzzy systems.

PATTERN CLASSIFIER  

UNSUPERVISED CLASSIFICATION  
Clustering for unsupervised learning and classification - Clustering concept-C-means algorithm-Hierarchical clustering procedures- Graph theoretic approach to pattern clustering - Validity of clustering solutions.

STRUCTURAL PATTERN RECOGNITION  
Elements of formal grammars-String generation as pattern description - recognition of syntactic description- Parsing-Stochastic grammars and applications - Graph based structural representation.

FEATURE EXTRACTION AND SELECTION  

NEURAL NETWORKS  

Lecture: 45 Periods   Tutorial: 0 Periods   Practical: 0 Periods   Total: 45 Periods

REFERENCE BOOKS:
COURSE OUTCOMES:

Upon completion of the course, the students will have:

**CO1**: Apply parametric estimation and supervised learning techniques for pattern classification

**CO2**: Describe the structural pattern recognition methods

**CO3**: Apply neural networks, fuzzy systems and Genetic algorithms to pattern recognition and classification.

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L – Low, M – Moderate (Medium), H- High
18VLOE28 VLSI DESIGN
(Common to all Branches)

PREREQUISITES: Nil

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COURSE OBJECTIVES
- To gain knowledge on MOS and CMOS Circuits with its characterization
- To design CMOS logic and sub-system
- To understand low power CMOS VLSI Design

INTRODUCTION TO MOS CIRCUITS
MOS Transistor Theory - Introduction MOS Device Design Equations - MOS Transistor as a Switches - Pass Transistor - CMOS Transmission Gate - Complementary CMOS Inverter - Static Load MOS Inverters - Inverters with NMOS loads - Differential Inverter - Tri State Inverter - BiCMOS Inverter.

CIRCUIT CHARACTERIZATION AND PERFORMANCE ESTIMATION
Delay Estimation, Logical Effort and Transistor Sizing, Power Dissipation, Sizing Routing Conductors, Charge Sharing, Design Margin and Reliability.

CMOS CIRCUIT AND LOGIC DESIGN
CMOS Logic Gate Design, Physical Design of CMOS Gate, Designing with Transmission Gates, CMOS Logic Structures, Clocking Strategies, I/O Structures.

CMOS SUB SYSTEM DESIGN
Data Path Operations - Addition/Subtraction, Parity Generators, Comparators, Zero/One Detectors, Binary Counters, ALUs, Multipliers, Shifters, Memory Elements, Control-FSM, Control Logic Implementation.

LOW POWER CMOS VLSI DESIGN

Lecture: 45 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS:
**COURSE OUTCOMES:**

After completing this course, the students will have:

- **CO1**: knowledge on MOS and CMOS Circuits with its characterization
- **CO2**: an ability to design CMOS logic and sub-system
- **CO3**: an understanding of low power CMOS VLSI Design

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L – Low,  M – Moderate (Medium),  H- High
PREREQUISITES: Nil

COURSE OBJECTIVES:
- To acquire knowledge on MOS circuit configuration and CMOS amplifier
- To analyze and design Operational amplifier
- To understand mixed signal circuits

MOS CIRCUIT CONFIGURATION (9)
Basic CMOS Circuits - Basic Gain Stage - Gain Boosting Techniques - Super MOS Transistor - Primitive Analog Cells, Current Source, Sinks and References MOS Diode/Active resistor, Simple current sinks and mirror, Basic current mirrors, Advance current mirror, Current and Voltage references, Bandgap references.

CMOS AMPLIFIER (9)

CMOS DIFFERENTIAL AMPLIFIER (9)

BICMOS CIRCUIT TECHNIQUES AND CURRENT-MODE SIGNAL PROCESSING (9)

ANALOG FILTERS AND A/D CONVERTERS (9)
Sampled - Data Analog Filters, Over Sampled A/D Converters and Analog Integrated Sensors: First - order and Second SC Circuits - Bilinear Transformation – Cascade Design – Switched - Capacitor Ladder Filter

REFERENCE BOOKS:
5. Greogorian and Tames, “Analog Integrated Circuit for Switched Capacitor Circuits”,

Lecture: 45 Periods   Tutorial: 0 Periods   Practical: 0 Periods   Total: 45 Periods

18VLOE29 ANALOG & MIXED MODE VLSI CIRCUITS
(Common to all Branches)

Category: OE

L T P C
3 0 0 3
**COURSE OUTCOMES:**

Upon completion of this course, the students will have:

**CO1:** Knowledge on MOS circuit configuration and CMOS amplifier

**CO2:** To analyze and design Operational amplifier

**CO3:** An understanding on mixed signal circuits

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L – Low, M – Moderate (Medium), H - High
PREREQUISITES: Nil

COURSE OBJECTIVES
- To gain knowledge on HDLs and Modeling styles
- To understand the VHDL and Verilog HDL.
- To design sub-systems USING VHDL/VERILOG

BASIC CONCEPTS OF HARDWARE DESCRIPTION LANGUAGES
VLSI Design flow, Features of VHDL, Capabilities, Hierarchy, Syntax and Semantics of VHDL; Basic Language Elements - Data objects - Variable signal, and constant, Data types, Operators and signal assignments, Design Suits - Entities, architecture declaration, configurations, Packages.

MODELING STYLES (VHDL)
Behavioral Modeling - Process statement, Sequential assignment statements, Loops, wait statement, assertion statement, Delay Model – Inertial delay Model, Transport delay model; Gate Level Modeling – Component instantiation statements; Data flow Modeling - Concurrent assignment statement, Conditional assignment statements, Procedures, functions, Generics, attributes, Model simulation - Writing a test bench, Logic Synthesis.

INTRODUCTION TO VERILOG HARDWARE DESCRIPTION LANGUAGE
Key features, Capabilities, Language Constructs and Conventions in Verilog, Syntax and Semantics of Verilog; Basic Language Elements: Operators, nets, registers, vectors, arrays, parameters, system tasks, complier directives, Module, port connection rules.

MODELING STYLES (VERILOG)
Gate Level Modeling - Gate types, Gate delays; Dataflow Modeling – continuous assignment, Behavioral Modeling - Initial & Always Construct, Assignments with Delays, wait construct, Multiple always blocks, If and if - else, assign, Loop Construct, Sequential and Parallel blocks, Switch level modeling - MOS switches, CMOS switches.

DESIGN SUB-SYSTEMS USING VHDL/VERILOG
Combinational logics – Adder, Subtractor, Decoders, Encoders, Multiplexer, code Converter; Flip flop, state machines – Mealy type FSM, Moore type FSM, Counters and Shift register. Synthesis of digital logic circuits.

Lecture: 45 Periods    Tutorial: 0 Periods    Practical: 0 Periods    Total: 45 Periods
REFERENCE BOOKS:


COURSE OUTCOMES:

After completing this course, the students will have:

- **CO1**: Knowledge on HDLs and Modeling styles
- **CO2**: To write the VHDL and Verilog HDL codes
- **CO3**: To design sub-systems USING VHDL/VERILOG

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L – Low, M – Moderate (Medium), H- High
18CSOE31 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
(Common to All Branches)

Category : OE
L T P C
3 0 0 3

PREREQUISITES: Nil

COURSE OBJECTIVES:
Upon completion of this course, the students will be familiar with:
- Artificial Intelligence and intelligent agents, history of Artificial Intelligence
- Building intelligent agents (search, games, constraint satisfaction problems)
- Machine Learning algorithms
- Applications of AI (Natural Language Processing, Robotics/Vision)
- Solving real AI problems through programming with Python, Tensor Flow and Keras library

UNIT I FOUNDATIONS OF AI

UNIT II SUPERVISED AND UNSUPERVISED LEARNING
Maximum likelihood estimation - Regression - Linear, Multiple, Logistic - bias-variance, Bayes rule, maximum a posteriori inference - Classification techniques - k-NN, naive Bayes - Decision Trees - Clustering - k-means, hierarchical, high-dimensional - Expectation Maximization.

UNIT III ENSEMBLE TECHNIQUES AND REINFORCEMENT LEARNING

UNIT IV DEEP LEARNING
Neural Network Basics - Deep Neural Networks - Recurrent Neural Networks (RNN) - Deep Learning applied to Images using CNN - Tensor Flow for Neural Networks & Deep Learning

UNIT V AI APPLICATIONS

Lecture: 45 Periods  Tutorial : 0 Periods  Practical: 0 Periods  Total: 45 Periods
REFERENCE BOOKS:

4. Michael Nielson, “Neural Networks and Deep Learning”

COURSE OUTCOMES:

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

CO1: Develop expertise in popular AI & ML technologies and problem-solving methodologies. [Familiarity]

CO2: Use fundamental machine learning techniques, such as regression, clustering, knearest neighbor methods, etc. [Usage]

CO3: Distinguish between supervised and unsupervised machine learning methods. [Usage]

CO4: Gain knowledge of the different modalities of Deep learning currently used. [Familiarity]

CO5: Use popular AI & ML technologies like Python, Tensorflow and Keras to develop Applications. [Usage]

CORRELATION BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES:

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L – Low, M – Moderate (Medium), H- High
18CSOE32 COMPUTER NETWORK ENGINEERING
(Common to All Branches)

Category : OE
L T P C
3 0 0 3

PREREQUISITES: Nil

COURSE OBJECTIVES:
Upon completion of this course, the students will be familiar with:
- The hardware and software architecture of Computer Networks
- The concepts of internetworking
- Issues in resource allocation
- End-to-end protocols and data transmission
- Network management models

UNIT I FOUNDATION L(9)

UNIT II INTERNETWORKING L(9)

UNIT III CONGESTION CONTROL AND RESOURCE ALLOCATION L(9)
Issues in Resource allocation – Queuing disciplines – Congestion Control – Congestion avoidance mechanism – Quality of Service.

UNIT IV END-TO-END PROTOCOLS AND DATA L(9)

UNIT V NETWORK MANAGEMENT L(9)
SNMPv1 and v2 Organization and information model - Communication model – Functional model - SNMP proxy server- Remote monitoring- RMON1 and RMON2.

Lecture: 45 Periods  Tutorial : 0 Periods  Practical: 0 Periods  Total: 45 Periods

REFERENCE BOOKS
COURSE OUTCOMES:

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

CO1: Explain the architecture and applications of Computer Networks. [Familiarity]

CO2: Analyze the performance of MAC protocols. [Assessment]

CO3: Configure switches and Routers. [Assessment]

CO4: Design algorithms to ensure congestion control and QOS. [Usage]

CO5: Appreciate the performance of End-to-End protocols and data transmission techniques. [Assessment]

CO6: Use SNMP and RMON. [Usage]

CORRELATION BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES:

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L – Low, M – Moderate (Medium), H- High
COURSE OBJECTIVES: Upon completion of this course, the students will be familiar with:

- Statistical methods
- Bayesian, Support Vector and Kernel Methods
- Time Series Analysis and Rule Induction
- Neural networks and Fuzzy Logic
- Visualization Techniques

UNIT I  STATISTICAL CONCEPTS AND METHODS  L(9)

UNIT II  BAYESIAN METHODS AND SUPPORT VECTOR AND KERNEL METHODS  L(9)

UNIT III  TIME SERIES ANALYSIS AND RULE INDUCTION  L(9)

UNIT IV  NEURAL NETWORKS AND FUZZY LOGIC  L(9)
Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy models from data, fuzzy decision trees.

UNIT V  STOCHASTIC SEARCH METHODS AND VISUALIZATION  L(9)

Lecture: 45 Periods  Tutorial : 0 Periods  Practical: 0 Periods  Total: 45 Periods
REFERENCE BOOKS
5 David Loshin, “Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph”, Morgan Kaufmann, 2013.

COURSE OUTCOMES: Upon completion of this course, the students will be able to:
CO1: Explain the statistical concepts and methods. [Familiarity]
CO2: Use Bayesian, support vector and kernel Methods. [Usage]
CO3: Perform Time series analysis. [Usage]
CO4: Use Rule induction. [Usage]
CO5: Apply Neural network and Fuzzy logic. [Usage]
CO6: Use Stochastic search methods. [Usage]
CO7: Explain Visualization Techniques. [Familiarity]

CORRELATION BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES:

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L – Low, M – Moderate (Medium), H- High
18SEACZ1 - ENGLISH FOR RESEARCH PAPER WRITING
(Common to all Branches)

Category : AC

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PREREQUISITES: Nil

COURSE OBJECTIVES:
Upon completion of this course, the students will be familiar with:
- Writing quality research papers in English

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
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism

UNIT III
Sections of a Paper, Abstracts, Introduction, 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 Conclusions, useful phrases, how to ensure paper is as good as it could possibly be the first-time submission

Lecture: 30 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 30 Periods

REFERENCE BOOKS:
COURSE OUTCOMES:
Upon completion of this course the students will be able to,

**CO1**: Utilize writing skills to write best quality research paper and provide better readability.

**CO2**: Describe each section of a paper with clarity.

**CO3**: Review the papers efficiently.

**CO4**: Utilize the key skills to write title, abstract, introduction and literature review of the paper.

**CO5**: Write the methods, results, Discussion and Conclusion using the required skills and useful phrases.

COURSE ARTICULATION MATRIX:

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L-Low, M-Moderate (Medium), H-High
18SEACZ2 - DISASTER MANAGEMENT
(Common to all Branches)

Category : AC
L  T  P  C
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PREREQUISITES: Nil

COURSE OBJECTIVE:
Upon completion of this course, the students will be familiar with:
- Key concepts in disaster risk reduction.
- Types of disasters and hazards.
- Disaster prone areas in India.
- Strengths and weaknesses of disaster management approaches.
- Risk assessment methods.

UNIT I  INTRODUCTION
Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

UNIT II  PERCUSSIONS OF DISASTERS AND HAZARDS
Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT 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

Lecture: 30 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 30 Periods

REFERENCE BOOKS:
2  Sahni, Pardeep Et.Al. (Eds.),” Disaster Mitigation Experiences And Reflections”, Prentice Hall Of India, New Delhi.
COURSE OUTCOMES:
Upon completion of this course the students will be able to,

**CO1**: Differentiate hazard and disaster and types of disasters.

**CO2**: Identify the causes and types of manmade and natural disaster.

**CO3**: Describe the disaster prone areas in India.

**CO4**: To predict and, where possible, prevent disasters, mitigate their impact on vulnerable populations, and respond to and effectively cope with their consequences

**CO5**: Provide survival strategies based on risk assessment.

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L-Low, M-Moderate (Medium), H-High
18SEACZ3 - VALUE EDUCATION
(Common to all Branches)

Category : AC
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PREREQUISITES: Nil

COURSE OBJECTIVES:
Upon completion of this course, the students will be familiar with:
- Value of education and self-development
- Requirements of good values in students
- Importance of character

UNIT I - ETHICS AND SELF-DEVELOPMENT

UNIT II - PERSONALITY AND BEHAVIOR DEVELOPMENT

UNIT III - VALUES IN HUMAN LIFE

UNIT IV - VALUES IN SOCIETY

UNIT V - POSITIVE VALUES

Lecture: 30 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 30 Periods

REFERENCE BOOKS:
2. Dr. Yogesh Kumar Singh, “Value Education”, A.P.H Publishing Corporation, New Delhi
4. https://nptel.ac.in/courses/109104068/36
COURSE OUTCOMES
At the end of the course, students will be able to
CO1: Understand the values and work ethics
CO2: Enhance personality and behaviour development
CO3: Apply the values in human life.
CO4: Gain knowledge of values in society.
CO5: Learn the importance of positive values in human life.

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L-Low, M-Moderate (Medium), H-High
18SEACZ4 - CONSTITUTION OF INDIA
(Common to all Branches)

PREREQUISITES: Nil

COURSE OBJECTIVES:
Upon completion of this course, the students will be familiar with:

- Indian constitution
- Constitutional rights & duties
- Organs of governance
- Local administration
- Roles and functions of Election commission

UNIT I - INDIAN CONSTITUTION
History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working) - Philosophy of the Indian Constitution: Preamble Salient Features

UNIT II - CONSTITUTIONAL RIGHTS & DUTIES

UNIT III - ORGANS OF GOVERNANCE
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 IV - LOCAL ADMINISTRATION

UNIT V - ELECTION COMMISSION
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.

Lecture: 30 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 30 Periods
REFERENCE BOOKS:
1 The Constitution of India, 1950 (Bare Act), Government Publication.

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

CO1: Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

CO2: Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

CO3: Understand the various organs of Indian governance.

CO4: Familiarize with the various levels of local administration.

CO5: Gain knowledge on election commission of India.

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L-Low, M-Moderate (Medium), H-High
18SEACZ5 - PEDAGOGY STUDIES
(Common to all Branches)

Category : AC
L  T  P  C
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PREREQUISITES: Nil

COURSE OBJECTIVES:
Upon completion of this course, the students will be familiar with:

- Understanding of various theories of learning, prevailing pedagogical practices and design of curriculum in engineering studies.
- Application of knowledge in modification of curriculum, its assessment and introduction of innovation in teaching methodology.

UNIT I – INTRODUCTION

UNIT II - PEDAGOGICAL PRACTICES
Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education. Evidence on the effectiveness of pedagogical practices Methodology for the in depth stage: quality assessment of included studies.

UNIT III - PEDAGOGICAL APPROACHES
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. Teacher’s attitudes and beliefs and Pedagogic strategies.

UNIT IV - PROFESSIONAL DEVELOPMENT
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 - CURRICULUM AND ASSESSMENT
Research gaps and future directions Research design Contexts Pedagogy Teacher education Curriculum and assessment Dissemination and research impact.

Lecture: 30 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 30 Periods

REFERENCE BOOKS:
Upon completion of this course the students will be able to,

**CO1**: Explain the concept of curriculum, formal and informal education systems and teacher education.

**CO2**: Explain the present pedagogical practices and the changes occurring in pedagogical approaches.

**CO3**: Understand the relation between teacher and community, support from various levels of teachers to students and limitation in resources and size of the class.

**CO4**: Perform research in design a problem in pedagogy and curriculum development.

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L-Low, M-Moderate (Medium), H-High
18SEACZ6 - STRESS MANAGEMENT BY YOGA
(Common to all Branches)

Category : AC
L  T  P  C
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PREREQUISITES: Nil

COURSE OBJECTIVES:
Upon completion of this course, the students will be familiar with:

- Eight parts of yoga
- Techniques to achieve overall health of body and mind
- Breathing techniques and its effects

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

UNIT II
Yam and Niyam.-Do’s and Don’t’s in life.

UNIT III
Ahinsa, satya, astheya, bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan.

UNIT IV
Asan and Pranayam : Various yog poses and their benefits for mind & body.

UNIT V
Regularization of breathing techniques and its effects-Types of pranayam.

Lecture: 30 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 30 Periods

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, AdvaitaAshrama(Publication Department), Kolkata

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:

CO1: Understand the basics of Yoga.
CO2: Identify Do’s and Don’t’s in life.
CO3: Follow ethical and moral guidelines given by Yamas and Niyamas in life.
CO4: Develop healthy mind in a healthy body thus improving social health by Asan and Pranayam
**CO5:** Use breathing techniques to live a stress free life

**COURSE ARTICULATION MATRIX:**

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L-Low, M-Moderate (Medium), H-High
COURSE OBJECTIVES:
Upon completion of this course, the students will be familiar with:

- Techniques to achieve the highest goal happily
- How to become a person with stable mind, pleasing personality and determination
- Awakening wisdom in students

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)

UNIT II
Verses- 52,53,59 (dont’s)-Verses- 71,73,75,78 (do’s). - Approach to day to day work and duties.-Shrimad Bhagwad Geeta - Chapter 2-Verses 41, 47,48,

UNIT III
Shrimad Bhagwad Geeta -Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,-Chapter 18-Verses 45, 46, 48.

UNIT IV
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.

UNIT V
Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18,38,39-Charecter 18 – Verses 37,38,63

Lecture: 30 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 30 Periods

REFERENCE BOOKS:
1. “Srimad Bhagavad Gita” by Swami Swarupananda-Advaita Ashram (Publication Department), Kolkata
2. Bharthrihari’s Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.
COURSE OUTCOMES:
On completion of this course, students will be able to

**CO1**: Understand the Holistic development
**CO2**: Understand the day to day work and duties
**CO3**: Understand mankind to peace and prosperity
**CO4**: Become versatile personality.

COURSE ARTICULATION MATRIX:

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L-Low, M-Moderate (Medium), H-High
18SEACZ8 - SANSKRIT FOR TECHNICAL KNOWLEDGE 
(Common to all Branches)

Category : AC
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PREREQUISITES: Nil

COURSE OBJECTIVES:
Upon completion of this course, the students will be familiar with:
- Alphabets and tense of the language.
- Sentence formation
- The Technical information in Sanskrit Literature

UNIT I
Alphabets in Sanskrit, Past/Present/Future Tense

UNIT II
Simple Sentences - Order, Introduction of roots

UNIT III
Technical information about Sanskrit Literature

UNIT IV
Technical concepts of Engineering-Electrical, Mechanical

UNIT V
Technical concepts of Engineering-Architecture, Mathematics

Lecture: 30 Periods  Tutorial: 0 Periods  Practical: 0 Periods  Total: 30 Periods

REFERENCE BOOKS:
1. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication

COURSE OUTCOMES:
Upon completion of this course the students will be able to,
CO1: Read and write sentences
CO2: Explore the huge knowledge from ancient literature
CO3: Use technical concepts to develop logic in mathematics and engineering.
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