### Sona College of Technology, Salem
(An Autonomous Institution)

Courses of Study for ME I Semester under Regulations 2015

Civil Engineering

Branch: Structural Engineering

<table>
<thead>
<tr>
<th>S. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Lecture</th>
<th>Tutorial</th>
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**Total Credits** 26

Approved by

Chairperson, Civil Engineering BOS  
Dr. R. Malathy

Member Secretary, Academic Council  
Dr. R. Shivakumar

Chairperson, Academic Council & Principal  
Dr. M. Usha

Copy to:-
HOD/Civil, First Semester ME STR Students and Staff, COE

08.08.2017  
Regulations-2015
Course outcomes

- Solve boundary value problem of hyperbolic and parabolic equations using Laplace transform and Fourier transform.
- Solve boundary value problem of Laplace and Poisson equations using transforms techniques.
- Describe the concepts in calculus of variation, state different types of Euler’s equation and solve variational problems using Ritz and Kantorovich methods.
- Explain the various algorithm of characteristic equation using Feddeev-Leverrier method, eigen value and eigen vector using Power method and Rayleigh-Ritz method.
- Explain the various numerical integration techniques and its applications using Gauss Hermite Quadrature and mapping function when the function in the analytic form is too complicated.

UNIT – I  ONE DIMENSIONAL WAVE AND HEAT EQUATIONS  9 + 6

UNIT – II  ELLIPTIC EQUATION  9 + 6
Laplace equation – Properties of harmonic functions – Solution of Laplace’s equation by means of Fourier transforms in a half plane, in an infinite strip and in a semi-infinite strip. Solution of poisson equation by Fourier transform method.

UNIT – III  CALCULUS OF VARIATIONS  9 + 6
Concept of variation and its properties – Euler’s equation – Functional dependant on first and higher order derivatives – Functionals dependent on functions of several independent variables – Variational problems with moving boundaries –direct methods- Ritz and Kantorovich methods.

UNIT – IV  EIGEN VALUE PROBLEMS  9 + 6

UNIT – V  NUMERICAL INTEGRATION  9 + 6
Gaussian Quadrature – One and Two Dimensions – Gauss Hermite Quadrature – Monte Carlo Method-multiple integration using mapping function.

Total: (L:45+T:30)  = 75 Hours

(In all units derivations are not included)

References:

Course Objectives
To enable students to
- Design Corbels, shear walls, flat slab and grid floors
- Explain the concepts of ductile detailing of R.C. members as per IS Codes
- Discuss the Inelastic behaviour of R.C. beams
- Design R.C.C. Beams and columns using limit state method
- Explain the concepts of ductile detailing of R.C. members as per IS Codes

UNIT – I Review of limit State Design
9+6
Design for limit state of collapse
- Design of beams for combined effect of shear, bending moment and torsion
- Design of short and slender columns including biaxial bending
- Design for limit state of serviceability
- Calculation of deflection and crack width according to IS and ACI codes

UNIT – II Design of special R.C. Elements
9+6
Design of R.C. walls - Shear walls
- Classification and design principles
- Rectangular and Flanged shear walls
- Design of corbels
- Design of deep beams

UNIT – III Design of Flat slabs and Grid floors
9+6
Yield line analysis of slabs
- Hillerberg’s strip method of design of slab
- Design of flat slab
- Equivalent frame method of design
- Approximate analysis and Design of grid floors

UNIT – V Detailing Requirements
9+6
Design and detailing of structural members using seismic design
- Reinforcement detailing of structural members as per SP:34 & IS:5525
- Earthquake Resistant Design
- Detailing requirements for Ductility as per IS:13920
- Fire resistance of buildings

Lecture : 45, Tutorial : 30 , Total : 75 Hours

Course Outcomes:
At the end of the study of the course, the student should be able to
- Familiarize in the Design of Corbels, shear walls, flat slab and grid floors
- Explain the concepts of ductile detailing of R.C. members as per IS Codes
- Exposure about the the Inelastic behaviour of R.C. beams
- Design of R.C.C. Beams and columns using limit state method
- Exposure about the concepts of ductile detailing of R.C. members as per IS Codes

References
Course Objectives

To enable students to

- Discuss the principal of dynamics.
- Discuss the Multi Degree of Freedom System.
- Discuss the Dynamic Response of Multi Degree of Freedom Systems.
- Discuss Continuous Systems.
- Discuss the Design of Structures Subjected to Dynamic Loads.

UNIT – I Principles of Dynamics

Formulation of Equations of Motion by different methods-Problems on Formulation of Equation of motion-Single degree of freedom systems-Free and Forced response- Effect of Damping-Simple Problems on beams and frames.

UNIT – II Multi Degree of Freedom System


UNIT – III Dynamic Response of Multi Degree of Freedom Systems


UNIT – IV Continuous Systems

Modelling- Free and forced vibrations of bars- Flexural vibration of simply supported beams- Modes and frequencies- Orthogonality properties of normal modes of continuous systems.

UNIT – V Design of Structures Subjected to Dynamic Loads


Lecture : 45, Tutorial : 30 , Total : 75 Hours

Course outcomes:

At the end of the study of the course, the student should be able to

- Solve to the problems related to the principal of dynamics.
- Exposure the Multi Degree of Freedom System.
- Capable of solving real time problems related to the Dynamic Response of Multi Degree of Freedom Systems.
- Familiarize in explaining concepts in Continuous Systems.
- Exposure to the Design of Structures Subjected to Dynamic Loads.

References

Course Objectives
To enable students to
- Explain the Stress and Strain in Cartesian Coordinates
- Discuss Two Dimensional Problems in Cartesian Coordinates
- Study Two Dimensional Problems in Polar Coordinates
- Discuss the problems related to Torsion of prismatic hollow sections
- Explain the behavior of members due to elastic and plastic stages

UNIT – I Analysis of Stress and Strain in Cartesian Coordinates

UNIT – II Two Dimensional Problems in Cartesian Coordinates

UNIT – III Two Dimensional Problems in Polar Coordinates
General equations in polar coordinates - stress distribution symmetrical about an axis - pure bending of curved bars - strain components in polar coordinates - displacements for symmetrical stress distribution - Rotating Disc - Bending of a curved bar by force at the end - Effect of circular hole on stress distribution - concentrated force at a point of a straight boundary - Forces on wedges - A circular disc with diametric loading.

UNIT – IV Torsion of Prismatic Bars
General solutions of the problem by displacement (St. Venant's warping function) and force (Prandtl's stress function) approaches - Membrane analogy-Torsion of shafts of circular and noncircular (elliptic, triangular and rectangular) cross sectional shapes. Torsion of thin rectangular section and hollow thin walled single and multicelled sections.

UNIT – V Introduction to Plasticity

Total (L:45 + T:30 ) = 75 Hours

Course outcomes:
At the end of the study of the course, the student should be able to
- Familiar with the elastic and plastic stage by the more general theory of elasticity and plasticity
- Familiarize the Stress and Strain behavior in Cartesian Coordinates
- Exposure to Two Dimensional Problems in Cartesian Coordinates
- Able to solve Two Dimensional Problems in Polar Coordinates
- Capable of solving problems related to Torsion of prismatic hollow sections

References
Objectives

To enable the students to

- Study the behaviour of shallow foundation
- Design of the retaining structures
- Design of pile foundation
- Explain the behaviour of well foundation
- Design the machine foundation

Unit-I Shallow Foundations 9 + 6
Bearing capacity and settlement – Spread footing – Contact pressure – Structural design of individual footings, pedestals, combined footings (Rectangular and trapezoidal), Strap footings – Eccentrically loaded footings – Mat foundation.

Unit-II Retaining structures 9 + 6

Unit-III Pile Foundations 9 + 6
Types of Piles- Static and dynamic pile formula – Pile load tests – Negative skin friction – Pile groups – Efficiency of pile group – Settlement of piles – Batter piles – Analysis of pile groups – Structural design of piles and pile caps- Floating foundation

Unit-IV Well foundation 9 + 6
Types of wells or caissons – Components – Shapes of wells – Forces acting – Construction and sinking – Design of drilled caissons.

Unit-V Machine foundations and foundations on expansive 9 + 6

Total (L:45 + T:30 ) = 75 Hours

Course outcomes

At the end of this course students will be capable to

- Describe the concept of Shallow foundation
- Analysis and design of retaining structures
- Study the types and design of Pile foundations
- Study the design of Well foundations
- Study the design of Machine foundations

References:
1. P.C.Varghese, Foundation Engineering , PHI Learning Private Limited , New Delhi , 2004
P15STR106  Stability of Structures   L T P C  3 2 0 4  100

Course Objectives
To enable the students to
• Explain the buckling behavior of columns
• Describe the approximate methods of analysis for finding buckling loads
• Discuss the buckling behavior of beams, columns and frames
• Explain the concepts of lateral and torsional buckling of beams
• Describe the buckling behavior of thin plates

UNIT – I Stability of Columns
Concepts of Elastic Structural stability- Analytical approaches to stability - characteristics of stability analysis- Elastic Buckling of columns- Equilibrium; Energy and Imperfection approaches – Non-prismatic columns- Built up columns- Buckling modes- Effect of shear on buckling load - Large deflection theory.

UNIT – II Methods of Analysis and In Elastic Buckling
Approximate methods – Rayleigh and Galerkin methods – numerical methods – Finite difference and finite Element analysis of columns – Experimental study of column behaviour – South well plot - Column curves - Derivation of Column design formula - Effective length of Columns - Inelastic behaviour- Tangent modulus and Double modulus theory

UNIT – III Beam Columns and Frames
Beam column behaviour- standard cases- Continuous columns and beam columns – Columns on elastic foundation – Buckling of frames – Single storey portal frames with and without side sway – Classical and stiffness methods – Use of Wood’s charts.

UNIT – IV Buckling of Beams

UNIT – V Buckling of Thin Plates

Total (L:45 + T:30 ) = 75 Hours

Course outcomes
At the end of the study of the course, the student should be able to
• Discuss the concept, analytical approaches and characteristics of stability
• Identify various buckling modes column with various approaches
• Analysis of columns under approximate methods and numerical methods
• Study the inelastic behaviour of column
• Analyse the buckling of frames under classical, stiffness methods and use of Wood’s charts
• Describe lateral buckling of beams under energy method and torsional buckling of beams under Equilibrium and energy approach
• Explain the buckling behavior of thin plates using energy methods and numerical techniques

References
Course Objectives
- At the end of this course, students will be able to design concrete mixes
- They will acquire practical knowledge about the testing of fresh and hardened concrete
- Students will get a practical knowledge about the non-destructive tests, measuring devices and their field applications

List of Experiments
1. Concrete Mix Design - I.S. code Method
2. Fresh properties of Self Compacting Concrete using slump flow, L Box and V Funnel Tests
3. Determination of modulus of Elasticity of Concrete using Compressometer
4. Strength and Deflection Characteristics of simply supported R.C. Beams
5. Strength and Deflection Characteristics of simply supported steel Beams
6. Testing of R.C. Columns subjected to Concentric Loading
7. Determination of in-situ strength and quality of concrete using (a) Rebound hammer and (b) Ultrasonic Pulse Velocity Tester
8. Determination of Impact Resistance of concrete
9. Determination of Permeability of concrete
10. Measurement of Cracks
11. Study of Measuring devices such as
   - Beggs Deformeter
   - Mechanical Strain Gauge
   - Optical strain gauge
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Approved by

Chairperson, Civil Engineering BOS  Member Secretary, Academic Council  Chairperson, Academic Council & Principal
Dr.R.Malathy  Dr.R.Shivakumar  Dr.M.Usha

Copy to:-
HOD/Civil, First Semester ME CEM Students and Staff, COE

08.08.2017  Regulations-2015
COURSE OUTCOMES:
At the end of this course the students will be able to,
- Define the estimators, analyze the characteristics of the estimators, find the estimate of the parameters using M.L.E and method of moments.
- Test the attributes and variables of large and small samples.
- Describe multiple and partial correlation and plane of regression, multiple and partial regression
- Analyse the variances of several variables while applying standard designs like CRD, RBD and LSD
- Describe the multivariate density and its properties and also analyzing the principal components.

UNIT I ESTIMATION THEORY
9+6

UNIT II TESTING OF HYPOTHESIS
9+6
Tests based on Normal, t, $\chi^2$ and F distributions for testing of means, variance and proportions – Analysis of r x c tables – Goodness of fit.

UNIT III MULTIPLE AND PARTIAL CORRELATION AND MULTIPLE AND PARTIAL REGRESSION
9+6
Multiple and Partial Correlation – Method of Least Squares – Plane of Regression – Properties of Residuals – Coefficient of multiple correlation – Coefficient of partial correlation – Multiple correlation with total and partial correlations – Multiple and Partial Regression and Partial correlations in terms of lower order co-efficient.

UNIT IV DESIGN OF EXPERIMENTS
9+6
Analysis of variance – One-way and two-way classifications – Completely randomized design – Randomized block design – Latin square design.

UNIT V MULTIVARIATE ANALYSIS
9+6

L: 45 + T: 30 TOTAL: 75 HOURS

REFERENCES:
COURSE OBJECTIVES:

To enable students to

- Study and understand the properties of modern construction materials used in construction such as special concretes, metals, composites, water proofing compounds, non weathering materials, and smart materials.

UNIT – I CONCRETE AND METALS

High Strength Concrete and High Performance Concrete – Applications- Properties of steel - New alloy steels - Aluminium and its products – applications.

UNIT – II ALLOYS

Other Alloys - Market forms - Uses - Light weight metals - Copper and Zinc alloys

UNIT – III COMPOSITES


UNIT – IV OTHER MATERIALS


BITUMEN: Bitumen chemistry – Traditional properties – Susceptibility parameters – ageing of bitumen.

UNIT – V SMART AND INTELLIGENT MATERIALS

Brief outline and uses - Smart materials - Types of smart and intelligent materials - Usage in advanced construction - Smart structures - energy efficient building constructions.

TOTAL: 45 HOURS

COURSE OUTCOMES:

On completion of the course, the student will be able to

- select suitable materials for modern construction
- select composite materials used for manufacturing ultra high strength concrete
- utilize smart materials in advanced construction

REFERENCE BOOKS:

COURSE OBJECTIVES:

To enable students to

- study and understand the various types of equipments used for earthwork, tunneling, drilling, blasting, dewatering, material handling conveyors and its applications in construction projects.

UNIT – I CONSTRUCTION EQUIPMENT AND MANAGEMENT 9


UNIT – II EQUIPMENTS FOR EARTH WORK 9


UNIT – III OTHER CONSTRUCTION EQUIPMENT 9


UNIT – IV MATERIALS HANDLING EQUIPMENTS 9

Equipment for Materials Handling - Forklifts and related equipment - Portable Material Bins - Conveyors - Hauling Equipment - Crushers - Feeders - Screening Equipment.

UNIT – V CONCRETE PLANTS 9


TOTAL: 45 HOURS

COURSE OUTCOMES:

On completion of the course, the student will be able to

- execute control over the scheduling, management and operating cost of equipments used in construction projects.
- select suitable type of equipment required for the job.
- select and recommend the equipment needed for material handling and concreting.

REFERENCE BOOKS:

PROJECT FORMULATION AND APPRAISAL L T P C  3 0 0 3

COURSE OBJECTIVES:

To enable students to

- study and understand the formulation, costing of construction projects, appraisal, finance and private sector participation.

UNIT I  PROJECT FORMULATION  9


UNIT II  PROJECT COSTING  9


UNIT III  PROJECT APPRAISAL  9


UNIT IV  PROJECT FINANCING  9


UNIT V  PRIVATE SECTOR PARTICIPATION  9

Private sector participation in Infrastructure Development Projects - BOT, BOLT, BOOT - Technology Transfer and Foreign Collaboration - Scope of Technology Transfer.

TOTAL: 45 HOURS

COURSE OUTCOME:

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

- know the formulations of projects, projects costing, appraisal and financing.

REFERENCES:

2. Joy P.K., Total Project Management - The Indian Context, New Delhi, Macmillan India Ltd., 1992
P15CEM105 CONSTRUCTION PLANNING, SCHEDULING AND CONTROL  3 0 0 3

COURSE OBJECTIVES:

To enable students to

- study and understand the concept of planning, scheduling, cost and quality control, safety during construction, organization and use of project information necessary for construction project.

UNIT I  CONSTRUCTION PLANNING  9


UNIT II  SCHEDULING PROCEDURES AND TECHNIQUES - I  9


UNIT III  SCHEDULING PROCEDURES AND TECHNIQUES – II  9

Scheduling with Uncertain Durations – Calculations for Monte Carlo Schedule Simulation – Crashing and Time/Cost Tradeoffs – Improving the Scheduling Process.

UNIT IV  COST CONTROL, MONITORING AND ACCOUNTING  9


UNIT V  ORGANIZATION AND USE OF PROJECT INFORMATION  9


TOTAL : 45 HOURS

COURSE OUTCOME:

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

- know the development of construction planning, scheduling procedure and controls.
REFERENCES:

COURSE OBJECTIVES:

On completion of this course the students will be able to

• prepare a mix design for the various mix proportions
• enumerate the properties of ingredients used in concretes
• explain the different types of special concrete and their applications in construction.
• explain different types of non destructive testing methods.

Unit I  Concrete

Microstructure of concrete: Aggregate phase, hydrated cement paste, interfacial transition transition zone.

Strength: strength-porosity relationship, failure modes in concrete, factors affecting compressive strength, behavior of concrete under various stress states.

Dimensional stability: Elastic behavior, drying shrinkage and creep, thermal shrinkage and thermal properties of concrete.

Unit II  Proportioning concrete mixtures

Significance and objectives, general considerations, procedures, Methods of concrete mix design, design of high strength and high performance concrete using relevant codes. Testing and control of concrete quality: Methods and significance, accelerated strength testing, core tests and quality control charts.

Unit III  Durability of concrete


Unit IV  Special types of concrete


Unit V  Non destructive methods

Surface hardness methods, Penetration resistance techniques, pull out tests, maturity method, stress wave propagation methods, electrical methods, electrochemical methods, electromagnetic methods, Tomography of reinforced concrete.

TOTAL : 45 HOURS

REFERENCES:

6. Shetty M.S., Concrete Technology, S.Chand and Company Ltd. Delhi, 2003
COURSE OBJECTIVES:

To enable students to

- This course provides a thorough knowledge of material selection through the material testing based on specification.

LIST OF EXPERIMENTS

1. Mix design of concrete as per IS, ACI & BS methods for high performance concrete.
3. Effect of minerals and chemical admixtures in concrete at fresh and hardened state with relevance to workability, strength and durability.
4. NDT on hardened concrete - UPV, Rebound hammer and core test.
5. Permeability tests on hardened concrete – Demonstration

TOTAL: 45 HOURS

COURSE OUTCOME:

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

- test the concrete mixes designed as per IS, ACI and BS methods.
- know various tests on hardened concrete.
### Courses of Study for ME I Semester under Regulations 2015

**Mechanical Engineering**

**Branch: M.E. Engineering Design**

<table>
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<th>S. No</th>
<th>Course Code</th>
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**Practical**

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</table>

**Total Credits 22**

---

Approved by

**Chairman, Mechanical Engineering BOS**
Dr. D. Senthilkumar

**Member Secretary, Academic Council**
Dr. R. Shivakumar

**Chairperson, Academic Council & Principal**
Dr. M. Usha

Copy to:--

HOD/MECH, First Semester ME END Students and Staff, COE

08.08.2017

Regulations-2015
Course Code: P15END101
Course Name: ADVANCED NUMERICAL METHODS

Pre-requisite subjects: Mathematics I & II, Transforms and Partial Differential Equations and Numerical Methods

Course Outcomes

Upon completion of this course the students will be able to

| CO1 | Apply numerical methods for algebraic or transcendental equation |
| CO2 | Apply numerical technique for solving IVPs and BVPs in ODEs and characteristics value problem by using suitable method |
| CO3 | Describe and obtain the solution of partial differential equations that are time-dependent |
| CO4 | Describe and obtain the solution of partial differential equations that are time-independent |
| CO5 | Explain the concept of finite element method, orthogonal collocation method, orthogonal collocation with finite element method and Galerkin finite element method for solving PDEs |

Unit I  ALGEBRAIC EQUATIONS  L 9 T 3

Unit II  ORDINARY DIFFERENTIAL EQUATIONS  L 9 T 3
Runge Kutta Methods for system of IVPs, numerical stability, solution of stiff ODEs, shooting method, BVP: Finite difference method, orthogonal collocation method, orthogonal collocation with finite element method, Galerkin finite element method.

Unit III  FINITE DIFFERENCE METHOD FOR TIME  L 9 T 3
Dependent partial differential equations
Parabolic equations: explicit and implicit finite difference methods, weighted average approximation - Dirichlet and Neumann conditions - Two dimensional parabolic equations – ADI method; First order hyperbolic equations – method of characteristics.

Unit IV  FINITE DIFFERENCE METHOD FOR TIME  L 9 T 3
Independent partial differential equations
Laplace and Poisson’s equations in a rectangular region: Five point finite difference schemes, Leibmann’s iterative methods, Dirichlet and Neumann conditions – Laplace equation in polar coordinates: finite difference schemes – approximation of derivatives near a curved boundary while using a square mesh.

Unit V  FINITE ELEMENT METHOD  L 9 T 3

Tutorials: 15 Hrs
Total : 60 Hrs

Content Beyond Syllabus
1. Thomas algorithm for tridiagonal system
2. Faddeev – Leverrier Method
3. Adams-Bashforth multistep method
4. Method of lines
5. Crank-Nicholson Method
6. Wave equation- Explicit scheme
Learning Resources

Reference books

Course Code P15END102
Course Name COMPUTER APPLICATIONS IN DESIGN


Course Outcomes
Upon completion of this course the students will be able to

| CO1 | Impart knowledge on parametric sketching |
| CO2 | Practice modeling, assembly, tolerance analysis of Mechanical components |
| CO3 | Design Rapid tooling in computers |
| CO4 | Impart knowledge on visual basic, pro/program, script, LISP etc |
| CO5 | Provide standardization and design optimization for geometry. |

Unit I  INTRODUCTION TO COMPUTER APPLICATIONS IN NEW PRODUCT DESIGN

Unit II  COMPUTERS IN DESIGN
Solid modeling of Mechanical components – associative features – Sheet metal components, nesting and development – plastic parts with draft and shrinkage allowance – Reverse engineering of components – assembly of parts – tolerance analysis – mass property calculations

Unit III  COMPUTERS IN TOOLING DESIGN
Mould design – jigs and fixtures design – check for interferences – mechanism design and analysis – Rapid tooling

Unit IV  COMPUTERS IN DESIGN PRODUCTIVITY
Customizing various software by using visual basic, pro/program, script, LISP etc to write applications like design of shafts, gears etc.

Unit V  MANAGING PRODUCT DESIGN DATA

Total: 45 Hrs

Content Beyond Syllabus
1. Basics of AUTOCAD
2. Interchangeability in Design
3. Design of Casting
Learning Resources

Reference Books

Course Code: P15END103
Course Name: FINITE ELEMENT ANALYSIS

Pre-requisite subjects: Engineering Mathematics, Numerical Methods, Strength of Materials, Heat and mass transfer and Finite Element Analysis

Course Outcomes

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

- **CO1**: Provide further Advanced FEA knowledge and techniques for solving 1D complex problems in engineering.
- **CO2**: Gain Knowledge to solve two-dimensional problems.
- **CO3**: Provide Knowledge to expertise in basic elements, Iso-parametric elements.
- **CO4**: Impart Knowledge to structural dynamics applications.
- **CO5**: Understand non-linear problems and error estimates.

Unit I  INTRODUCTION & ONE-DIMENSIONAL PROBLEMS  L 10 T 3

Unit II  TWO-DIMENSIONAL PROBLEMS  L 10 T 3

Unit III  ISOPARAMETRIC ELEMENTS  L 8 T 3

Unit IV  STRUCTURAL DYNAMICS APPLICATIONS  L 9 T 3

Unit V  NON-LINEAR PROBLEMS & ERROR ESTIMATES  L 8 T 3

Tutorials: 15 Hrs
Total: 60 Hrs

Content Beyond Syllabus
1. Two-dimensional mesh generation – advancing front method
2. Three-dimensional mesh generation – Delaunay triangulation
3. Coupled problems
4. Transient response by analytical procedures
Learning Resources
Reference Books
Course Code: P15END104
Course Name: CONCEPTS OF ENGINEERING DESIGN

Pre-requisite subjects: Finite element Analysis, CAD/CAM/CIM, Engineering materials and Metallurgy, Manufacturing Technology I & II, Product Quality Development.

Course Outcomes

Upon completion of this course the students will be able to

<table>
<thead>
<tr>
<th>CO1</th>
<th>Impart knowledge on design process</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2</td>
<td>Gain knowledge on mathematical modelling, geometric modelling.</td>
</tr>
<tr>
<td>CO3</td>
<td>Understand material selection Chart, Pugh selection method, selection with computed aided databases</td>
</tr>
<tr>
<td>CO4</td>
<td>Develop knowledge on material processing and design</td>
</tr>
<tr>
<td>CO5</td>
<td>Understand and respond Environmental and safety issues.</td>
</tr>
</tbody>
</table>

Unit I THE DESIGN PROCESS


Unit II TOOLS IN ENGINEERING DESIGN


Unit III MATERIAL SELECTION AND MATERIALS IN DESIGN

The Classification and properties of Engineering materials, material standards and specifications – Methods of material selection – Ashby Chart and method of weight factors, Derivation of material indices, Use of material selection Chart, Pugh selection method, selection with computed aided databases – Design for brittle fracture, Design for fatigue failure, Design for corrosion resistance, Designing with plastics.

Unit IV MATERIAL PROCESSING AND DESIGN

Classification of manufacturing processes and their role in design, Factors determining the process selection, use of process selection chart and computerized database – Design for manufacturing, Design for forging and sheet metal forming, Design for casting, Design for machining, welding and assembly, design for residual stresses and heat – treatment

Unit V LEGAL, ETHICAL ENVIRONMENTAL AND SAFETY ISSUES IN DESIGN AND QUALITY ENGINEERING


Total: 45 Hrs

Content Beyond Syllabus

1. Basic concept of design
2. Design procedures
3. Design application in industries
4. Basic quality concepts
Learning Resources

Reference Books


Course Code: P15END105
Course Name: MICRO ELECTRO MECHANICAL SYSTEMS DESIGN


Course Outcomes

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

| CO1 | Make scale up and scale down the physical quantities of micro system |
| CO2 | Impart knowledge on MEMS with their manufacturing techniques |
| CO3 | Impart knowledge on micromechanics |
| CO4 | Describe packaging techniques of MEMS |
| CO5 | Design micro systems in various applications like automotive industry, biomedical etc. |

Unit I  INTRODUCTION

Unit II  MATERIALS AND FABRICATION PROCESS
Substrates and wafer - single crystal silicon wafer - formation ideal substrates - mechanical properties - silicon compounds - SiO₂, SiC, Si₂N₄ and polycrystalline silicon - Silicon piezoresistors - Gallium aresenside, Quartz - piezoelectric crystals - polymers for MEMS - conductive polymers - Photolithography - Ion implantation - Diffusion - Oxidation - CVD - Physical vapor deposition - Deposition by epitaxy - etching process

Unit III  MICROMECHANICS
Introduction - static bending of thin plates - circular plates with edge fixed - rectangular plate with all edges fixed and square plate with all edges fixed - Mechanical vibration - resonant vibration - micro accelerometers - design theory and damping coefficients - thermo mechanics - thermal stresses - fracture mechanics - stress intensity factors, fracture toughness and interfacial fracture mechanics.

Unit IV  MICRO SYSTEM MANUFACTURING

Unit V  MICRO SYSTEM DESIGN
Design considerations - process design - mask layout design - mechanical design - applications of micro system in - automotive industry - biomedical - aerospace - telecommunications

Total: 45 hrs

Content Beyond Syllabus

1. Micro Gyroscope
2. Micro robots
3. Sensors used in Aircraft control panels
Learning Resources

Reference Books
Course Code: P15END501
Course Name: RAPID PROTOTYPING AND TOOLING


Course Outcomes
Upon completion of this course the students will be able to

| CO1 | Describe exhaustive knowledge in RPT Tooling |
| CO2 | Impart knowledge in stereolithography systems selective laser sintering |
| CO3 | Describe fusion deposition modeling |
| CO4 | Provide Knowledge in laminated object manufacturing |
| CO5 | Apply concepts of RPT in component development |

Unit I INTRODUCTION
Need for the compression in product development, History of RP systems, Survey of applications, Growth of RP industry, and classification of RP systems.

Unit II STEREOLITHOGRAPHY SYSTEMS

Unit III FUSION DEPOSITION MODELING

Unit IV LAMINATED OBJECT MANUFACTURING

Unit V RAPID TOOLING SOFTWARE FOR RAPID PROTOTYPING
Indirect Rapid Tooling - Silicone rubber tooling, Aluminum filled epoxy tooling, Spray metal tooling, etc. Direct Rapid Tooling - Direct AIM, Quick cast process, Copper polyamide, Rapid Tool, DMILS, ProMetal, Sand casting tooling, Laminate tooling, soft tooling vs hard tooling. STL files, Overview of Solid view, Magics, mimics, magics communicator, etc. Internet based softwares, Collaboration tools. RAPID MANUFACTURING PROCESS OPTIMIZATION - Factors influencing accuracy, Data preparation errors, Part building errors, Errors in finishing, Influence of part build orientation. ALLIED PROCESSES - Vacuum Casting, Surface Digitizing, Surface Generation from point cloud, Surface modification, data transfer to solid models.

Total: 45 Hrs

Content Beyond Syllabus
1. Laser 3D printing
2. Smart materials used in RPT
3. Advanced Treatment for cleaning the prototypes
Learning Resources

Reference books


Pre-requisite subjects: Machine Drawing and CAD laboratory

Course Outcomes

Upon completion of this course the students will be able to

| CO1 | Understand the basic concepts of modeling and analysis softwares like PRO-E/SOLID WORKS/SOLID EDGE/CATIA/NX/ANSYS/NASTRAN etc. |
| CO2 | Familiar with the sectioning concepts and drawing standards. |
| CO3 | Develop part models by sketching. |
| CO4 | Assemble part models into an assembly. |
| CO5 | Create detailed drawing of assembly to understand 2D views. |

LIST OF EXPERIMENTS

Total: 45 Hrs

1. Introduction to CAD and solid works
2. Study of Sectional views and types of keys
3. Study of drawing standards
4. Split muff coupling – Part, Assembly and Detail drawing
5. Protected type Flange coupling – Part, Assembly and Detail drawing
6. Pipe vice – Part, Assembly and Detail drawing
7. Screw jack – Part, Assembly and Detail drawing
8. Simple eccentric – Part, Assembly and Detail drawing
9. Universal coupling – Part, Assembly and Detail drawing
10. Plummer block – Part, Assembly and Detail drawing
11. Claw coupling – Part, Assembly and Detail drawing
12. Knuckle joint – Part, Assembly and Detail drawing
13. Bushed Pin type Flexible Coupling – Part, Assembly and Detail drawing
14. Oldham’s coupling – Part, Assembly and Detail drawing
15. Machine Vice – Part, Assembly and Detail drawing

List of Equipments

1. Computer workstation 20
2. Software requirement
   (a) PRO-E/SOLID WORKS/SOLID EDGE/CATIA/NX/ANSYS/NASTRAN
### Courses of Study for ME I Semester under Regulations 2015

#### Mechanical Engineering

**Branch: M.E. Industrial Safety Engineering**

<table>
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<tr>
<th>S. No</th>
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**Total Credits** 20

Approved by

**Chairman, Mechanical Engineering BOS**
Dr. D. Senthilkumar

**Member Secretary, Academic Council**
Dr. R. Shivakumar

**Chairperson, Academic Council & Principal**
Dr. M. Usha

Copy to:–
HOD/MECH, First Semester ME ISE Students and Staff, COE

08.08.2017

Regulations-2015
Course Code : P15ISE101
Course Name : INDUSTRIAL SAFETY AND HAZARDS MANAGEMENT

Lecture - 3 Hrs/Week Internal Marks 50
Tutorial - 0 Hrs/Week External Marks 50
Practical - Credits 3

Pre-requisites subject: Nil

Upon completion of this course the students will be able to

C01 Analyze the hazards potential of industrial processes and various types of explosions.
C02 Explain and use various types of preventive and protective systems from fire and explosions.
C03 Have knowledge of various hazards indices and the methods to identify and analyze them.
C04 Estimate the levels of leakage of liquids, vapour and gases and the measures of mitigation.
C05 Analyze and discuss various disastrous events occurred and give suggestions for future prevention

UNIT I  FIRE AND EXPLOSION  L 9 T 0

UNIT II  RELIEF SYSTEMS  L 9 T 0
Preventive and protective management from fires and explosion-inerting, static electricity passivation, ventilation, and sprinkling, proofing, relief systems – relief valves, flares, scrubbers.

UNIT III  TOXICOLOGY  L 9 T 0
Hazards identification-toxicity, fire, static electricity, noise and dust concentration; Material safety data sheet, hazards indices- Dow and Mond indices, hazard operability (HAZOP) and hazard analysis (HAZAN).

UNIT IV  LEAKS AND LEAKAGES  L 9 T 0
Spill and leakage of liquids, vapors, gases and their mixture from storage tanks and equipment; Estimation of leakage/spill rate through hole, pipes and vessel burst; Isothermal and adiabatic flows of gases, spillage and leakage of flashing liquids, pool evaporation and boiling; Release of toxics and dispersion. Naturally buoyant and dense gas dispersion models; Effects of momentum and buoyancy; Mitigation

UNIT V  CASE STUDIES  L 9 T 0
Flixborough, Bhopal, Texas, ONGC offshore, HPCL Vizag and Jaipur IOC oil-storage depot incident; Oil, natural gas, chlorine and ammonia storage and transportation hazards.
Content beyond syllabus

- Critical Control Point
- Fault Tree Analysis
- Chemical Process Safety
- Reliability Engineering
- Risk Assessment

Learning Resources

Text book:

References:
Course Code : P15ISE102
Course Name : PRINCIPLES OF SAFETY MANAGEMENT

Lecture - 3 Hrs/Week
Tutorial - 0 Hrs/Week
Practical -

Pre-requisites subject: Nil

Upon completion of this course the students will be able to

C01 Evaluate safety concepts and current safety related issues
C02 demonstrate how safety audits should be done and in what ways the findings should be analyzed.
C03 Explain the principles of accident investigation and prevention
C04 know the various measures of safety performance.
C05 be familiar with present efforts of government and private agencies to create the safety awareness and training.

UNIT I    CONCEPTS AND TECHNIQUES   L 9 T 0


UNIT II    SAFETY AUDIT - INTRODUCTION   L 9 T 0

Components of safety audit, types of audit, audit methodology, non conformity reporting (NCR), audit checklist and report – review of inspection, remarks by government agencies, consultants, experts – perusal of accident and safety records, formats – implementation of audit indication - liaison with departments to ensure co-ordination – check list – identification of unsafe acts of workers and unsafe conditions in the shop floor.

UNIT III    ACCIDENT INVESTIGATION AND REPORTING   L 9 T 0


UNIT IV    SAFETY PERFORMANCE MONITORING   L 9 T 0

ANSI (Z16.1) Recommended practices for compiling and measuring work injury experience – permanent total disabilities, permanent partial disabilities, temporary total disabilities - Calculation of accident indices, frequency rate, severity rate, frequency severity incidence, incident rate, accident rate, safety “t” score, safety activity rate – problems.

UNIT V    SAFETY EDUCATION AND TRAINING   L 9 T 0

Content beyond syllabus

- Safety management systems
- OSHA
- Environmental protection agency
- Emergency planning and response
- Permissible exposure limits

Learning Resources

Text book:

References:
2. Relevant India Acts and Rules, Government of India.
Course Code : P15ISE103
Course Name : ENVIRONMENTAL SAFETY

Lecture - 3 Hrs/Week Internal Marks 50
Tutorial - 2 Hrs/Week External Marks 50
Practical - Credits 4

Pre-requisites subject: Nil

Upon completion of this course the students will be able to

<table>
<thead>
<tr>
<th>Course Outcomes</th>
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<tbody>
<tr>
<td>C01 Explain various source of air pollution, and various types of radiation hazards.</td>
</tr>
<tr>
<td>C02 Analyze the various water pollutants like industrial effluents and the methods of treating and disposing them.</td>
</tr>
<tr>
<td>C03 Identify the options for collection treatments and disposal of various solid and radioactive wastages.</td>
</tr>
<tr>
<td>C04 Explain the methods, equipments for measuring and control environmental pollution.</td>
</tr>
<tr>
<td>C05 Recommend the ways of pollution control in various process industries.</td>
</tr>
</tbody>
</table>

UNIT I   AIR POLLUTION   L 9 T 3
Classification and properties of air pollutants - Pollution sources - Effects of air pollutants on human beings, Animals, Plants and Materials - automobile pollution-hazards of air pollution-concept of clean coal combustion technology - ultra violet radiation, infrared radiation, radiation from sun-hazards due to depletion of ozone - deforestation-ozone holes-automobile exhausts-chemical factory stack emissions-CFC.

UNIT II   WATER POLLUTION   L 9 T 3

UNIT III   HAZARDOUS WASTE MANAGEMENT   L 9 T 3

UNIT IV   ENVIRONMENTAL MEASUREMENT AND CONTROL   L 9 T 3

Total Number of Periods: 60

Content beyond syllabus

- Genetically modified organisms
- Polluter pays principles
- Indian wildlife protection act
- Social impact assessment
- Healthy development measurement tools

Learning Resources

Text book:

References:
**Course Code**: P15ISE104  
**Course Name**: OCCUPATIONAL HEALTH AND INDUSTRIAL HYGIENE

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<th>Component</th>
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<td>Practical</td>
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</tbody>
</table>

Pre-requisites subject: Nil

**Upon completion of this course the students will be able to**

- **C01** Explain the concept of physical hazards like noise, sound, radiation and OSHA standards.
- **C02** state the concept of chemical hazards like gas, fog, fumes and industrial hygiene calculation.
- **C03** explain and describe biological and ergonomical hazards and bio hazards control program.
- **C04** know the concept of occupational health services and industrial toxicology.
- **C05** Explain the importance of occupational physiology and work organization.

**UNIT I  PHYSICAL HAZARDS**

Noise, compensation aspects, noise exposure regulation, properties of sound, occupational damage, risk factors, sound measuring instruments, octave band analyzer, noise networks, noise surveys, noise control program, industrial audiometry, hearing conservation programs- vibration, types, effects, instruments, surveying procedure, permissible exposure limit. Ionizing radiation, types, effects, monitoring instruments, control programs, OSHA standard- nonionizing radiations, effects, types, radar hazards, microwaves and radio-waves, lasers, TLV- cold environments, hypothermia, wind chill index, control measures- hot environments, thermal comfort, heat stress indices, acclimatization, estimation and control.

**UNIT II  CHEMICAL HAZARDS**


**UNIT III  BIOLOGICAL AND ERGONOMICAL HAZARDS**

Classification of Biohazardous agents – examples, bacterial agents, rickettsial and chlamydial agents, viral agents, fungal, parasitic agents, infectious diseases - Biohazard control program, employee health program-laboratory safety program-animal care and handling-biological safety cabinets - building design.
UNIT IV OCCUPATIONAL HEALTH AND TOXICOLOGY

Concept and spectrum of health - functional units and activities of occupational health services, preemployment and post-employment medical examinations - occupational related diseases, levels of prevention of diseases, notifiable occupational diseases such as silicosis, asbestosis, pneumoconiosis, siderosis, anthracosis, aluminosis and anthrax, lead-nickel, chromium and manganese toxicity, gas poisoning (such as CO, ammonia, coal and dust etc) their effects and prevention – cardio pulmonary resuscitation, audiometric tests, eye tests, vital function tests. Industrial toxicology, local, systemic and chronic effects, temporary and cumulative effects, carcinogens entry into human systems

UNIT V OCCUPATIONAL PHYSIOLOGY


Total Number of Periods: 45

Content beyond syllabus

- Preventive medicines
- Exposure assessment
- Occupational exposure limits
- World health organization
- Employment of children
- Muscular skeleton disorder

Learning Resources

Text book:

References:
Course Code : P15ISE105
Course Name : INDUSTRIAL SAFETY HEALTH AND ENVIRONMENTAL ACTS

Lecture - 4 Hrs/Week Internal Marks 50
Tutorial - 0 Hrs/Week External Marks 50
Practical - Credits 4

Pre-requisites subject: Nil

Upon completion of this course the students will be able to

C01 Explain the factory act regarding, health, safety and workers welfare.
C02 Explain the various aspects of the environmental act, powers and function of statutory authorities of central and state government.
C03 identify the list of hazardous and toxic chemical and the safety procedure to be followed.
C04 explain various Acts regarding boiler, motor vehicles, mines, construction workers, explosive pesticides.
C05 be familiar with the international acts and standards regarding occupational safety and health.

UNIT I FACTORIES ACT – 1948

Statutory authorities – inspecting staff, health, safety, provisions relating to hazardous processes, welfare, working hours, employment of young person’s – special provisions – penalties and procedures-Tamilnadu Factories Rules 1950 under Safety and health chapters of Factories Act 1948

UNIT II ENVIRONMENT ACT – 1986


UNIT III MANUFACTURE, STORAGE AND IMPORT OF HAZARDOUS CHEMICAL RULES 1989


UNIT IV OTHER ACTS AND RULES


UNIT V INTERNATIONAL ACTS AND STANDARDS

Content beyond syllabus

- Seoul declarations
- National pension scheme
- Debt bondage in India
- Employment of children (Sumangali)
- Unfair dismissal

Learning Resources

Text book:

References:
Course Code : P15ISE505
Course Name : SAFETY IN CONSTRUCTION

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<td>Tutorial</td>
<td>0 Hrs/Week</td>
<td>External Marks</td>
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<td>Credits</td>
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</table>

Pre-requisites subject: Nil

Upon completion of this course the students will be able to

- **C01** Analyze and prevent the causes of accidents in a construction site and also to decide the amount of compensation
- **C02** Explain various hazards associated with a construction site and how to work safely in each type of project
- **C03** Know the laws of safety to be followed when working at height and methods of preventing fall
- **C04** Operate various construction equipments and to train others in safe handling those equipments
- **C05** Explain what are the safety measures to be taken during a demolition process

### UNIT I ACCIDENTS CAUSES AND MANAGEMENT SYSTEMS

L 9 T 0

Problems impeding safety in construction industry- causes of fatal accidents, types and causes of accidents related to various construction activities, human factors associated with these accident – construction regulations, contractual clauses – Pre contract activates, preconstruction meeting - design aids for safe construction – permits to work – quality assurance in construction – compensation – Recording of accidents and safety measures – Education and training

### UNIT II HAZARDS OF CONSTRUCTION AND PREVENTION

L 9 T 0


### UNIT III WORKING AT HEIGHTS

L 9 T 0

Fall protection in construction OSHA 3146 – OSHA requirement for working at heights, Safe access and egress – safe use of ladders- Scaffolding s, requirement for safe work platforms, stairways, gangways and ramps – fall prevention and fall protection, safety belts, safety nets, fall arrestors, controlled access zones, safety monitoring systems – working on fragile roofs, work permit systems, height pass – accident case studies.

### UNIT IV CONSTRUCTION MACHINERY

L 9 T 0

Selection, operation, inspection and testing of hoisting cranes, mobile cranes, tower cranes, crane inspection checklist - builder’s hoist, winches, chain pulley blocks – use of conveyors – concrete mixers, concrete vibrators – safety in earth moving equipment, excavators, dozers, loaders, dumpers, motor grader, concrete pumps, welding machines, use of portable electrical tools, drills, grinding tools, manual handling scaffolding, hoisting cranes – use of conveyors and mobile cranes – manual handling..

08.08.2017

Regulations-2015
UNIT V SAFETY IN DEMOLITION WORK

Safety in demolition work, manual, mechanical, using explosive - keys to safe demolition, pre survey inspection, method statement, site supervision, safe clearance zone, health hazards from demolition - Indian standard - trusses, girders and beams – first aid – fire hazards and preventing methods – interesting experiences at the construction site against the fire accidents.

TOTAL NUMBER OF PERIODS = 45

Content beyond syllabus

- construction fatality rates
- Safety of non workers
- High visibility clothing
- Temporary fencing

Learning Resources

Text Book

REFERENCES
3. Handbook of OSHA Construction safety and health charles D. Reese and James V. Edison
Sona College of Technology, Salem  
(An Autonomous Institution)  
Courses of Study for ME I Semester under Regulations 2015  
Mechanical Engineering  
Branch: M.E. Product Design and Development

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Total Credits: 22

Approved by

Chairman, Mechanical Engineering BOS        Member Secretary, Academic Council        Chairperson, Academic Council & Principal  
Dr.D.Senthilkumar                        Dr.R.Shivakumar                                Dr.M.Usha

Copy to:-  
HOD/MECH, First Semester ME PDD Students and Staff, COE

08.08.2017  
Regulations-2015
Course Code: P15PDD101
Course Name: GEOMETRIC MODELING

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

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<th>Description</th>
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<tr>
<td>CO1</td>
<td>Explain the fundamentals of wire frame modeling technique and its representation.</td>
</tr>
<tr>
<td>CO2</td>
<td>Apply the fundamental concepts of surface modeling technique to product.</td>
</tr>
<tr>
<td>CO3</td>
<td>Draw the solid modeling of product by using B-rep and CSG techniques.</td>
</tr>
<tr>
<td>CO4</td>
<td>Discuss the fundamental concepts of hidden line removal, shading and colorings.</td>
</tr>
<tr>
<td>CO5</td>
<td>Apply the fundamental concepts of animation technique to some product using software.</td>
</tr>
</tbody>
</table>

Unit I  MATHEMATICAL REPRESENTATION OF CURVES  L 12 0 0
Introduction, types, Wire frame models, parametric representation of curves (analytic & synthetic), curve manipulation, design examples.

Unit II  MATHEMATICAL REPRESENTATION OF SURFACES  L 12 0 0
Introduction, Surface models, parametric representation, surface manipulation, design applications.

Unit III  MATHEMATICAL REPRESENTATION OF SOLIDS  L 12 0 0
Fundamentals of solid modeling, Boundary representation, constructive solid geometry, sweep representation, analytic solid modeler design applications.

Unit IV  VISUAL REALISATION  L 12 0 0
Introduction, model cleanup, hidden line removal, hidden surface removal, shading, coloring.

Unit V  COMPUTER ANIMATION:  L 12 0 0
Introduction to computer animation, computer animation, animation systems - types and technique, design applications, computer graphics standard. Laboratory practices.

TOTAL HOURS = 60

Learning Resources
Reference Books
OBJECTIVE

• The course aims at providing the basic concepts of product design, product features and its architecture so that student can have a basic knowledge of the common features a product has and how they can be incorporated suitably in products.

OUTCOMES: Upon completion of the course the student will be able to

• understand the integration of customer requirements in product design
• Apply structural approach to concept generation, selection and testing
• Understand various aspects of design such as industrial design, design for manufacture, analysis and product architecture

UNIT I  INTRODUCTION

Need for IPPD-Strategic importance of Product development - integration of customer, designer, material supplier and process planner, Competitor and customer - behavior analysis. Understanding customer-promoting customer understanding-involve customer in development and managing requirements - Organization process management and improvement

UNIT II  CONCEPT GENERATION, SELECTION AND TESTING


UNIT III  PRODUCT ARCHITECTURE

Product development management - establishing the architecture - creation - clustering - geometric layout development - Fundamental and incidental interactions - related system level design issues - secondary systems - architecture of the chunks - creating detailed interface specifications-Portfolio Architecture.

UNIT IV  INDUSTRIAL DESIGN


UNIT V  DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT

Definition - Estimation of Manufacturing cost-reducing the component costs and assembly costs – Minimize system complexity - Prototype basics - Principles of prototyping - Planning for prototypes - Economic Analysis - Understanding and representing tasks-baseline project planning - accelerating the project-project execution

TOTAL: 45 PERIODS

TEXT BOOK

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

**Course Objectives**

- **CO1** Explain the application of FEA in structural, heat transfer and fluid flow problems.
- **CO2** Solve the fundamental static problem using finite element analysis procedure.
- **CO3** Discuss the various solution techniques used in finite element analysis.
- **CO4** Solve the fundamental heat transfer problems and fluid flow problems.
- **CO5** Solve the fundamental dynamics analysis problems of kinematic models.

**Unit I  INTRODUCTION TO FEM**

- Engineering design and analysis - meaning and purpose- steady state, propagation and transient problems - basic concepts of FEM - applicability of FEM to structural analysis heat transfer and fluid flow problems - advantages and limitations of FEM - commercial finite element packages - organization - advantages & limitations.

**Unit II  STATIC ANALYSIS**

- General procedure of FEM - skeletal and continuum structures - Discretization of domain - basic types of elements - shape function - Rayleigh - Ritz method formulation of element stiffness matrices - truss, beam, triangular - CST element - Isoparametric elements.

**Unit III  SOLUTION METHODS FOR FINITE ELEMENT EQUATIONS**


**Unit IV  HEAT TRANSFER AND FLUID FLOW ANALYSIS**

- Basic equations of heat transfer & fluid flow problems - Galar kin method - finite element formulation - one dimensional heat and fluid flow problems.

**Unit V  MECHANISM ANALYSIS**

- Equations of motion for dynamic problems - consistent and lumped mass matrices - formulation of element mass matrices - free vibration and forced vibration problem formulation. Introduction to Analysis of mechanisms - Creation of kinematic models - imposition of constraints and forces - inertial data - static and dynamic analysis of kinematic systems.

**Total Hours**: Lecture + Tutorial = 45 + 15 = 60

**Learning Resources**

**Reference Books**

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

**Course Objectives**

- **CO1** Explain the fundamentals of Product Data Management.
- **CO2** Write the case study for document management.
- **CO3** Discuss configuration management and change management.
- **CO4** Explain the fundamentals of product life cycle management.
- **CO5** Compare sales configuration and product configurator.

**Unit I  INTRODUCTION**

Introduction to PDM-present market constraints-need for collaboration- internet and developments in server-client computing.

**Unit II  COMPONENTS OF PDM**

Components of a typical PDM setup-hardware and software- document management- creation and viewing of documents-creating parts-versions and version control of parts and documents- case studies.

**Unit III  CONFIGURATION MANAGEMENT AND CHANGE MANAGEMENT**


**Unit IV  PROJECTS AND ROLES**


**Unit V  GENERIC PRODUCTS AND VARIANTS**

Product configurator-comparison between sales configuration and product configurator- generic product modeling in configuration modeler- use of order generator for variant creation- registering of variants in product register-case studies.

**Total Hours: 45**

**Learning Resources**

**Reference Books**

3. Wind-chill R5.0 Reference manuals, 2000
Course Code: P15PDD105               L  T  P  C
Course Name: RAPID PROTOTYPING AND TOOLING  3  -  -  3

Upon completion of this course the students will be able to

CO1  Explain the fundamentals of liquid based rapid prototyping process. Discuss its process parameters.
CO2  Explain the fundamentals of solid based rapid prototyping process. Discuss its process parameters.
CO3  Explain the fundamentals of powder based rapid prototyping process. Discuss its process parameters.
CO4  Discuss the fundamentals of indirect and direct rapid tooling techniques in RP process.
CO5  Explain the fundamentals of STL file format and various rapid manufacturing.

Unit I   LIQUID BASED RAPID PROTOTYPING  L  9  T  0

Unit II  SOLID BASED RAPID PROTOTYPING  L  9  T  0
Laminated object manufacturing: principle of operation, LOM materials, process Details, applications. Fusion deposition modeling: principle, process parameters, path generation, Applications.

Unit III POWDER BASED RAPID PROTOTYPING  L  9  T  0
Selective laser sintering: types of machines, principle of operation, process Parameters, data preparation for SLS applications. Concept modelers: principle, thermo jet printer, sander's model market, 3-d printer, genisys xs printer, jp system 5, object Quadra system.

Unit IV   RAPID TOOLING  L  9  T  0
Laser Engineered Net Shaping (Lens), Indirect Rapid Tooling - Silicone rubber tooling, Aluminum filled epoxy tooling, Spray metal tooling, Cast Kirk site, 3D Keltool, etc. Direct Rapid Tooling - Direct AIM, Quick cast process, Copper polyamide, Rapid Tool, DMILS, ProMetal, Sand casting tooling, Lamine tooling, soft tooling vs. hard tooling.

Unit V   RAPID MANUFACTURING PROCESS  L  9  T  0

TOTAL HOURS: 45

Learning Resources

Reference Books
Course Code | P15PDD509  
Course Name | TOTAL QUALITY MANAGEMENT  
Course Objectives |  
CO1 Define the term quality, quality planning, quality control and total quality management.  
CO2 Explain the deming, juran and Crosby quality principles of TQM.  
CO3 Compare kaizen approach and Deming’s approach on quality.  
CO4 Explain various supporting tools and quality function deployment.  
CO5 Explain various quality standards and quality management.  

Unit I INTRODUCTION  
Definitions of the terms - quality, quality planning, quality control, quality assurance, quality management, Total Quality Management (TQM) as per ISO 8402 - overview on TQM - The TQM axioms - Commitment - Scientific knowledge - Involvement - Consequences of total quality.  

Unit II QUALITY PRINCIPLES  

Unit III TOTAL QUALITY CONTROL  
KAIZEN: Meaning - Kaizen and innovation - the Kaizen management practices - total quality control (TQC) - approaches of Faigenbaum, Ishikawa - Kaizen and TQC - Kanban systems - small group activities - quality control circles - suggestion systems - comparison of Kaizen and Deming's approach.  

Unit IV SUPPORTING TOOLS, AND TECHNIQUES:  
Affinity diagram - bar chart - block diagram - brainstorming - cause and effect analysis - customer- supplier relationship checklist - decision analysis - flow charts - force field analysis - line graph/run charts - Pareto analysis - quality costing - Quality Function Deployment (QFD) - quality project approach and the problem solving process.  

Unit V QUALITY STANDARD AND STRATEGIC QUALITY MANAGEMENT  
The structure of ISO 9000 series quality system standards - certification process - action plan development for cases. STRATEGIC QUALITY MANAGEMENT: Integrating quality into strategic management - Quality and the management cycle - Resources for Quality activities - Training for Quality - Self Managing Teams - Role of the Quality Director - Obstacles to achieving successful Strategic Quality Management.  

TOTAL HOURS: 45  

Learning Resources  
1. Logothetics N., “Managing for Total Quality - From Deming to Taguchi and SPC”, Prentice Hall of India Private Ltd., 1997  
Upon completion of this course the students will be able to

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<th>Course Objectives</th>
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<td>CO1</td>
<td>Explain the modeling, analysis, simulation and rapid prototyping.</td>
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<td>CO2</td>
<td>Draw 2D sketch using modeling software.</td>
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<td>CO3</td>
<td>Draw 3D modeling of product using modeling software.</td>
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<td>CO4</td>
<td>Assemble the basic product using modeling software.</td>
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<tr>
<td>CO5</td>
<td>Analyze the basic components using analysis software.</td>
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Ex. No | CAD LABORATORY | L 0 P 4 |
|-------|----------------|--------|
1.     | Introduction to modeling, analysis, simulation and rapid prototyping |
2.     | Introduction to solid works and COSMOS Xpress software |
3.     | Modeling of control arm rod |
4.     | Modeling of anchor plate |
5.     | Modeling of tray using 3d sketch |
6.     | Modeling of hook |
7.     | Modeling and assembly of screw jack |
8.     | Modeling and assembly of universal coupling |
9.     | Analysis and simulation of connecting rod |
10.    | Analysis and simulation of anchor plate |
11.    | Analysis and simulation of hook |
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Approved by

Chairperson, Electrical and Electronics Engineering BOS Dr.S.Padma
Member Secretary, Academic Council Dr.R.Shivakumar
Chairperson, Academic Council & Principal Dr.M.Usha

Copy to:- HOD/EEE, First Semester ME PED Students and Staff, COE

08.08.2017 Regulations-2015
COURSE OUTCOMES:
At the end of this course the students will be able to,
1. Describe the concepts in calculus of variations, state different types of Euler’s equation, solve variational and isoperimetric problems
2. State Z – transform, Discuss and prove the properties, state and apply convolution theorem to various functions, form and solve the difference equations
3. Classify random process, State autocorrelation and cross correlation and its properties, State properties of power spectral density, find autocorrelation and power spectral density, Describe Poisson process and its properties
4. Explain the algorithm of simplex method; two phase, Big-M and solve linear programming problems, state duality theory, apply dual simplex algorithm to LPP, find the optimal solutions to Transportation and Assignment problems
5. Formulate Non-linear programming problem, Describe optimization problems, state and apply Lagrangian method and Khun tucker conditions to Non-LPP, Describe and solve saddle point problems, solve Non-linear programming problem by using graphical method and Wolfe’s modified simplex method.

UNIT - I   Calculus of Variation  15
Functional – Euler’s equation – Variational problems involving one unknown function – Several unknown functions – Functional dependent on higher order derivatives – Several independent variables – Isoperimetric problems.

UNIT - II   Z – Transform  15

UNIT - III   Random Processes  15
Classification – Auto correlation – Cross correlation – Ergodicity – Power spectral density function – Poisson processes.

UNIT - IV   Linear Programming  15

UNIT - V   Non - Linear Programming  15

REFERENCES
P15PED102  ADVANCED POWER SEMICONDUCTOR DEVICES  3 0 0 3

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

1. Impart knowledge of basics of power semiconductor devices and its selection strategies to the application requirement.
2. Discuss static and dynamic characteristics of current controlled power semiconductor devices such as BJT and Thyristor.
3. Interpret performance parameters of power semiconductor devices from data sheet.
4. Explain the static and dynamic characteristics of voltage controlled power semiconductor devices.
5. Discuss features of firing and protection circuit for different devices.

UNIT - I  INTRODUCTION  9
Power switching devices overview – Attributes of an ideal switch, application requirements, circuit symbols; Power handling capability – (SOA); Device selection strategy – Features of MCT, SIT, IGCT On-state and switching losses – EMI due to switching–Power diodes-Types, static and switching characteristics – Voltage and current rating specification from data sheet.

UNIT – II  CURRENT CONTROLLED DEVICES  9

UNIT - IV  VOLTAGE CONTROLLED DEVICES  9
Power MOSFETs – Construction , types , static characteristics and switching characteristics, SOA - IGBTs – construction, types, static and switching characteristics , SOA - Performance parameters of MOSFET and IGBT from data sheet.

UNIT – IV  FIRING AND PROTECTING CIRCUITS  9
Necessity of isolation – pulse transformer – opto-coupler; Gate drive circuit for SCR, MOSFET, IGBT and base driving for power BJT – over voltage, over current and gate protection; Snubber circuit for Diode, Thyristor, Mosfet and BJT.

UNIT – V  THERMAL PROTECTION  9
Heat transfer – conduction, convection and radiation; Cooling – liquid cooling, vapour – phase cooling; Guidance for hear sink selection – Thermal resistance and impedance - Electrical analogy of thermal components, heat sink types and design – Mounting types.

Lecture : 45, Tutorial :00 , Total : 45

REFERENCES
ANALYSIS OF POWER CONVERTERS

COURSE OUTCOMES:
At the end of this course the students will be able to,
1. Analyze the switching circuits.
2. Analyze and study about the controlled rectifiers.
3. Discuss the various modes of operation of Dc- Dc switch mode converters.
4. Analyze the various types of Choppers.
5. Explain the principles and operations of regulators and cycloconverters.

UNIT – I SINGLE PHASE AC-DC CONVERTER

UNIT - II THREE PHASE AC-DC CONVERTER

UNIT - III DC-DC CONVERTERS

UNIT - IV AC VOLTAGE CONTROLLERS

UNIT - V AC- AC POWER CONVERTER

Lecture: 45, Tutorial: 30, Total: 75

REFERENCES
P15PED104  ANALYSIS OF INVERTERS  3003

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

1. Explain the electrical circuit concepts behind the different working modes of inverters so as to enable deep understanding of their operation.
2. Design different single phase and three phase inverters
3. Relate with required skills to derive the criteria for the current source inverters.
4. Design different types of multilevel inverters
5. Analysis and comprehend the various operating modes of different configurations of resonant inverters.

UNIT I  SINGLE PHASE INVERTERS  12
Introduction to self commutated switches: MOSFET and IGBT – Principle of operation of half and full bridge inverters – Performance parameters – Voltage control of single phase inverters using various PWM techniques – various harmonic elimination techniques – forced commutated Thyristor inverters.

UNIT II  THREE PHASE VOLTAGE SOURCE INVERTERS  9
180 degree and 120 degree conduction mode inverters with star and delta connected loads – voltage control of three phase inverters: single, multi pulse, sinusoidal, space vector modulation techniques.

UNIT III  CURRENT SOURCE INVERTERS  9

UNIT IV  MULTILEVEL INVERTERS  9
Multilevel concept – diode clamped – flying capacitor – cascade type multilevel inverters - Comparison of multilevel inverters - application of multilevel inverters

UNIT V  RESONANT INVERTERS  6
Series and parallel resonant inverters - voltage control of resonant inverters – Class E resonant inverter – resonant DC – link inverters.

Lecture : 45, Tutorial :00 , Total : 45

REFERENCES

08.08.2017  Regulations-2015
COURSE OUTCOMES
At the end of this course the students will be able to,

1. Relate the knowledge necessary to appreciate the MATLAB and PSPICE Models.
2. Discuss with required skills to derive the criteria for the PSPICE components.
3. Discuss with required skills to derive the criteria for the MATLAB components
4. Analyze, design and simulation of power electronic circuits with PSPICE software.
5. Analyze design and simulation of power electronic Drives with MATLAB software

UNIT - I  INTRODUCTION  9
Need for Simulation - Challenges in simulation - Classification of simulation programs - Overview of PSPICE, MATLAB and SIMULINK. Mathematical Modeling of Power Electronic Systems - Static and dynamic models of power electronic switches.

UNIT - II  PSPICE  9
File formats - Description of circuit elements - Circuit description – Output variables - Dot commands - SPICE models of Diode, Thyristor, BJT, Power MOSFET, IGBT.

UNIT - III  MATLAB  9
Toolboxes of MATLAB - Programming and file processing in MATLAB - Model definition and model analysis using SIMULINK - S-Functions

UNIT - IV  SIMULATION OF CONVERTERS USING PSPICE  9
Diode rectifiers - Controlled rectifiers - AC voltage controllers - DC choppers - Voltage source and current source inverters - Resonant pulse inverters.

UNIT - V  SIMULATION OF DRIVES USING MATLAB  9
Simulation of speed control schemes for DC motors – BLDC motor Drive – PMSM Drive Direct Torque control – PWM inverter fed Induction motor.

Lecture: 45, Tutorial: 00, Total: 45

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

1. Apply the switching techniques of various power semiconductor devices.
2. Explain single phase and three phase AC-DC converters.
3. Analyze and simulate the ac voltage controllers.
4. Design and simulate the various inverter circuits.
5. Design and simulate the dual converter.

LIST OF EXPERIMENTS
1. Modeling of simple PN Junction diode
2. Modeling of Silicon Controlled Rectifier.
3. Modeling of MOSFET
4. Modeling of IGBT.
5. Modeling of BJT.
6. Simulation of Single phase Semi converter
   (i) R Load   (ii) RL Load   (iii) RLE (motor) Load
7. Simulation of Single phase Fully controlled converter
   (i) R Load   (ii) RL Load   (iii) RLE (motor) Load
8. Simulation of Single phase Dual converter
9. Simulation of Three phase semi converter.
10. Simulation of Three phase fully controlled converter
11. Simulation of Single phase full bridge Inverter
12. Simulation of Three phase full bridge inverter.
    a) 180 degree mode operation
    b) 120 degree mode operation
13. Simulation of Three phase AC Voltage Controller.
    a) Lamp load
    b) Motor load

All the above experiments are performed using MATLAB

TOTAL: 60Hrs
COURSE OUTCOMES
At the end of this course the students will be able to,

1. Discuss the general aspects of HVDC transmission and their power devices
2. Analyze the equivalent circuits and characteristics of thyristor converters
3. Explain the different modes of gate control of converters and discuss the reactive power control
4. Illustrate the protection, harmonics and filters of HVDC systems
5. Analyze the simulation tools of HVDC systems.

UNIT - I  GENERAL ASPECTS  9

UNIT - II  ANALYSIS OF HVDC CONVERTERS  9
Choice of best circuit for HVDC converters – Analysis of HVDC converters – Different modes of converter operations - operation as rectifiers and inverters – converter equivalent circuits – parameters and characteristics of rectifiers and inverters - voltage source converters.

UNIT - III  CONTROL OF CONVERTERS AND REACTIVE POWER CONTROL  9
Gate control – basic means of control – desired features of control – control characteristics – system control hierarchy – firing angle control - constant current and extinction angle control - Starting and stopping of DC link – power control. Reactive Power Requirements – Reactive power control during steady state - sources of reactive power - reactive power control during Transients.

UNIT - IV PROTECTION OF HVDC SYSTEMS, HARMONICS AND FILTERS  9

UNIT - V  SIMULATION OF HVDC SYSTEMS  9

Lecture : 45, Tutorial : 00 , Total : 45

REFERENCES
Sona College of Technology, Salem  
(An Autonomous Institution)  
Courses of Study for ME I Semester under Regulations 2015  
Electrical and Electronics Engineering  
Branch: M.E. Power System Engineering

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Total Credits 23

Approved by

Chairperson, Electrical and Electronics Engineering BOS  
Dr.S.Padma

Member Secretary, Academic Council  
Dr.R.Shivakumar

Chairperson, Academic Council & Principal  
Dr.M.Usha

Copy to:-  
HOD/EEE, First Semester ME PSE Students and Staff, COE

08.08.2017  
Regulations-2015
COURSE OUTCOMES:
At the end of this course the students will be able to,

1. Describe the concepts in calculus of variations, state different types of Euler’s equation, solve variational and isoperimetric problems.

2. State Z – transform, Discuss and prove the properties, state and apply convolution theorem to various functions, form and solve the difference equations

3. Classify random process, State autocorrelation and cross correlation and its properties, State properties of power spectral density, find autocorrelation and power spectral density, Describe Poisson process and its properties

4. Explain the algorithm of simplex method; two phase, Big-M and solve linear programming Problems, state duality theory, apply dual simplex algorithm to LPP, find the optimal solutions to Transportation and Assignment problems

5. Formulate Non-linear programming problem, Describe optimization problems, state and apply Lagrangian method and Khun tucker conditions to Non-LPP, Describe and solve saddle point problems, solve Non-linear programming problem by using graphical method and Wolf’s modified simplex method.

UNIT - I  Calculus of Variation  15
Functional – Euler’s equation – Variational problems involving one unknown function – Several unknown functions – Functional dependent on higher order derivatives – Several independent variables – Isoperimetric problems.

UNIT - II  Z – Transform  15

UNIT - III  Random Processes  15
Classification – Auto correlation – Cross correlation – Ergodicity – Power spectral density function – Poisson processes.

UNIT - IV  Linear Programming  15

UNIT - V  Non - Linear Programming  15

Lecture: 45, Tutorial: 30, Total: 75

REFERENCE BOOKS

08.08.2017  Regulations-2015
COURSE OUTCOMES:
At the end of this course the students will be able to,

1. Describe the various sparsity techniques and factorization methods.
2. Analyze the various power flow solution methods.
3. Describe the symmetrical and unsymmetrical fault analysis in power systems.
4. Analyze the transient stability solution methods and case study demonstration.
5. Discuss various solution techniques for optimal power flow analysis.

UNIT I SOLUTION TECHNIQUES
Concept of sparsity for large scale power systems- Various sparsity techniques- Optimal ordering schemes for preserving sparsity. Flexible packed storage scheme for storing matrix as compact arrays –Factorization by Bifactorization and Gauss elimination methods.

UNIT II POWER - FLOW SOLUTIONS
Power flow equation in real and polar forms; Review of Gauss seidel and Newton Raphson method- Decoupled power flow method- Power flow studies in system design and operation-Regulating Transformers.

UNIT III SHORT CIRCUIT ANALYSIS
Symmetrical fault analysis using bus impedance matrix – Concepts in symmetrical components of unsymmetrical phasors- Sequence networks for various power system models- Unsymmetrical fault analysis in power systems.

UNIT IV TRANSIENT STABILITY ANALYSIS

UNIT V OPTIMAL POWER FLOW
Problem statement- Solution of optimal power flow- Gradient method and Newton’s method- Linear Sensitivity analysis- Linear programming methods- LP method with only real power variables – LP with AC power flow variables and detailed cost functions- Security constrained optimal power flow- Bus incremental costs.

Lecture: 45, Tutorial: 30, Total: 75

REFERENCE BOOKS
P15PSE103  POWER SYSTEM OPERATION AND CONTROL  3 2 0 4

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

1. Describe the various hydro thermal scheduling modeling and its solution techniques.
2. Solve the economic dispatch and unit commitment calculation.
3. Analyze the various state estimation methods and bad data identification.
4. Discuss various security assessment and enhancement procedures in power systems.
5. Analyze the various recent developments in power system operation and control.

UNIT - I  HYDRO THERMAL COORDINATION  15
Problem definition – Long range and Short range Hydro Scheduling problem - λ-γ iteration scheme for hydrothermal scheduling- Dynamic Programming solution to hydrothermal scheduling problem- Hydro Scheduling using Linear programming- Pumped storage hydro plants- Pumped storage scheduling with λ-γ iteration.

UNIT - II  ECONOMIC DISPATCH AND UNIT COMMITMENT  15

UNIT - III  STATE ESTIMATION  15

UNIT - IV  POWER SYSTEM SECURITY  15
Factors influencing power system security- System operating states by security control functions – Monitoring, evaluation of system state by contingency analysis – Security assessment using Linear Sensitivity factors-Security enhancement by preventive, emergency and restorative control.

UNIT - V  COMPUTER CONTROL OF POWER SYSTEM  15
Energy control center – Various levels – National – Regional and state level SCADA system – Computer configuration – Functions – Monitoring, data acquisition and controls – EMS systems – Software in EMS system – Expert system application for power system operation.

Lecture: 45, Tutorial: 30, Total: 75

REFERENCE BOOKS
COURSE OUTCOMES:
At the end of this course the students will be able to,
1. Analyze the concepts of switching transients of RL, RC, RLC circuits.
2. Solve the Velocity of travelling wave and characteristic impedance.
3. Analyze the Mechanism of lightning.
4. Discuss Sources of switching transients.
5. Analyze the Insulation coordination.

UNIT – I INTRODUCTION
Basic concepts of switching transients of RL, RC, RLC circuits- Types of power system transients – Lightning surges, Switching surges, Inductive energy transient and Capacitive energy transient - Effect of transients on power systems- Simulation of power system transients using EMTP, MATLAB – Surge voltage and surge current specifications.

UNIT - II TRAVELLING WAVE CONCEPTS
Velocity of travelling wave and characteristic impedance – Telegraphic Equation - Reflections and refraction of travelling waves – Bewley’s Lattice diagrams for various cases – Analysis in time and frequency domain – Eigen value approach.

UNIT - III LIGHTNING INDUCED TRANSIENTS
Mechanism of lightning–Simpson’s theory of thunderclouds-Direct and Indirect Strokes–Direct lightning stroke to a tower and line-Conventional lightning protection schemes for transmission lines and terminal equipments–Advanced Lightning protection technique: Collection Volume method (Dynasphere).

UNIT - IV SWITCHING TRANSIENTS

UNIT – V INSULATION CO-ORDINATION
Principles of insulation co-ordination – Recent advancements in insulation co-ordination – BIL, Design of EHV system – Insulation coordination as applied to transformer, substations – Examples.

Lecture: 45, Tutorial: 0, Total: 45

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

1. Describe the basic power quality issues
2. Evaluate harmonics in power system due to power electronic devices
3. Discuss about voltage related problems using software
4. Evaluate power quality using measuring equipments
5. Develop power quality using different types of filters.

UNIT – I INTRODUCTION

UNIT – II HARMONICS
Harmonics - individual and total harmonic distortion - RMS value of a harmonic waveform - triplex harmonics - important harmonic introducing devices - SMPS - Three phase power converters - arcing devices - saturable devices - Harmonic Distortion of fluorescent lamps - effect of power system harmonics on power system equipment and loads - Modeling of network and components under non-sinusoidal conditions - transmission and distribution systems - shunt capacitors - transformers - electric machines ground systems - loads that cause power quality problems - power quality problems created by drives and its impact on drives.

UNIT – III VOLTAGE RELATED PROBLEMS
Sources of sags and interruptions - estimating voltage sag performance - motor starting sags - estimating the sag severity - mitigation of voltage sags - active series compensators - static transfer switches and fast transfer switches - Sources of over voltages - Capacitor switching, lightning - Ferro resonance - mitigation of voltage swells - Surge arresters, low pass filters, power conditioners – Lightning protection, shielding, line arresters, protection of transformers and cables - computer analysis tools for transients, PSCAD and EMTP.

UNIT – IV POWER QUALITY MONITORING
Monitoring considerations - Power line disturbance analyzer - per quality measurement equipment - harmonic spectrum analyzer - flicker meters - disturbance analyzer - applications of expert system for power quality monitoring.

UNIT – V POWER QUALITY IMPROVEMENT

Lecture: 45, Tutorial: 0, Total: 45

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

1. Evaluate various system studies and different techniques used for system planning.
2. Simulate the dynamic analysis of power system

LIST OF EXPERIMENTS

1. Load flow analysis by Newton-Raphson method
2. Load flow analysis by Fast decoupled method
3. Contingency analysis: to calculate sensitivity factors.
4. Economic dispatch using lambda-iteration method
5. Unit commitment: Priority-list schemes and dynamic programming
6. Short circuit analysis in power system.
7. State estimation of power system network
8. Automatic Generation control for power system network
9. Familiarization of Relay Test Kit
10. Modeling and Simulation of AVR.

Total: 60 Hours
P15PSE501 HIGH VOLTAGE DIRECT CURRENT TRANSMISSION 3 0 0 3 (Common to Power Electronics & Drives and Power System Engineering)

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

1. Discuss the general aspects of HVDC transmission and their power devices
2. Analyze the equivalent circuits and characteristics of thyristor converters
3. Explain the different modes of gate control of converters and discuss the reactive power control
4. Illustrate the protection, harmonics and filters of HVDC systems
5. Analyze the simulation tools of HVDC systems.

UNIT - I GENERAL ASPECTS

UNIT - II ANALYSIS OF HVDC CONVERTERS
Choice of best circuit for HVDC converters – Analysis of HVDC converters – Different modes of converter operations - operation as rectifiers and inverters – converter equivalent circuits – parameters and characteristics of rectifiers and inverters - voltage source converters.

UNIT - III CONTROL OF CONVERTERS AND REACTIVE POWER CONTROL
Gate control – basic means of control – desired features of control – control characteristics – system control hierarchy – firing angle control - constant current and extinction angle control - Starting and stopping of DC link – power control. Reactive Power Requirements – Reactive power control during steady state - sources of reactive power - reactive power control during Transients.

UNIT - IV PROTECTION OF HVDC SYSTEMS, HARMONICS AND FILTERS

UNIT - V SIMULATION OF HVDC SYSTEMS

Lecture : 45, Tutorial : 00 , Total : 45

REFERENCE BOOKS
## Courses of Study for ME I Semester under Regulations 2015

### Electronics and Communication Engineering

#### Branch: M.E. Communication Systems

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### Practical

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**Total Credits**: 22

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**Approved by**

**Chairman, Electronics and Communication Engineering BOS**  **Member Secretary, Academic Council**  **Chairperson, Academic Council &Principal**

Dr.R.S.Sabeenian  Dr.R.Shivakumar  Dr.M.Usha

Copy to:-
HOD/ECE, First Semester ME COS Students and Staff, COE

08.08.2017  Regulations-2015
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<td>Poisson Process – Markovian Queues – Single and Multi-Server Models (Problems</td>
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<td></td>
<td>Only) – Little’s Formula – Steady State Analysis – Self Service Queue.</td>
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**REFERENCE BOOKS**

### COURSE OUTCOMES

At the end of each unit, the students will be able to –

1. Apply discrete random signal processing techniques to estimate and analyze spectral power.
2. Analyze spectrum estimation using parametric methods and non-parametric methods.
3. Analyze and interpret the estimation and prediction using Wiener FIR & IIR filters techniques.
4. Describe and apply the adaptive filtering concepts for non-stationary environment.
5. Analyze the sampling rate conservation using different filter structures.

### UNIT I DISCRETE RANDOM SIGNAL PROCESSING


### UNIT II SPECTRUM ESTIMATION


### UNIT III LINEAR ESTIMATION AND PREDICTION


### UNIT IV ADAPTIVE FILTERS


### UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING


Total: 60

### REFERENCE BOOKS

COURSE OUTCOMES
At the end of each unit, the students will be able to –

1. Describe and analyze the role of design approaches for coding and modulation techniques.
2. Analyze the performance of different receivers for AWGN and fading channels.
3. Describe and analyze the importance of Multicarrier systems.
4. Design and analyze trellis coded modulation techniques.
5. Design and apply turbo coding technique to detect and correct errors in communication systems.

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<th>REVIEW OF DIGITAL MODULATION TECHNIQUES</th>
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<th>RECEIVERS FOR AWGN AND FADING CHANNELS</th>
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<th>UNIT</th>
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<th>UNIT</th>
<th>TURBO CODING</th>
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Total: 45

REFERENCE BOOKS
COURSE OUTCOMES
At the end of each unit, the students will be able to -

1. Illustrate the optical network components for optical network communication networks.
2. Analyze the SONET/SDH network architecture and protection schemes in optical networks.
3. Analyze the wavelength network components and network design of wavelength routing networks.
4. Explain the various blocks of high capacity networks.
5. Analyze the various requirements for optical network design and management.

UNIT I
OPTICAL NETWORKING COMPONENTS

UNIT II
OPTICAL NETWORK ARCHITECTURES

UNIT III
WDM NETWORK DESIGN

UNIT IV
HIGH CAPACITY NETWORKS

UNIT V
NETWORK DESIGN AND MANAGEMENT

Total: 45

REFERENCE BOOKS
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<td>At the end of each unit, the students will be able to -</td>
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<tr>
<td>1.</td>
<td>Comprehend and describe an overview of antenna fundamentals and concepts of radiation.</td>
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<tr>
<td>2.</td>
<td>Design and synthesize different types of antenna arrays.</td>
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<td>3.</td>
<td>Analyze and evaluate different types of aperture antennas.</td>
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<tr>
<td>4.</td>
<td>Design and examine the microstrip patch antenna and feed network.</td>
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<td>5.</td>
<td>Design and analyze the performance of UWB, Leaky Wave Antennas and impact of antennas in medical applications.</td>
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<th>UNIT I</th>
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<th>UNIT IV</th>
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<th>UNIT V</th>
<th>MODERN ANTENNA APPLICATIONS</th>
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**REFERENCE BOOKS**

**COURSE OUTCOMES**

At the end of each unit, the students will be able to -

1. Illustrate the fundamental topics involved with wireless networking such as wireless LANs, wireless ATM and WiMAX.
2. Analyze the 3G and CDMA 2000 communication technology.
3. Analyze the routing protocols in wireless ad hoc and sensor networks.
4. Analyze the design considerations required for 3G networks.
5. Comprehend and describe 4G communication technology.

**UNIT I**  
**WIRELESS LAN AND PANs**  

**UNIT II**  
**3G TECHNOLOGY**  

**UNIT III**  
**AD HOC & SENSOR NETWORKS**  

**UNIT IV**  
**NETWORK DESIGN CONSIDERATION**  

**UNIT V**  
**INTRODUCTION TO 4G TECHNOLOGY**  

**REFERENCE BOOKS**

### COURSE OUTCOMES

At the end of each experiment, the students will be able to –

1. Practice to create the radiation pattern for various antennas.
2. Implement the adaptive filters, periodogram and multistage multirate system using DSP Processor
3. Design and simulate the turbo coding and QMF.
4. Simulate wireless channel equalizer design using DSP.
5. Evaluate the performance of digital data transmission through fiber optic link.

### LIST OF EXPERIMENTS

1. Design and simulate the modulation and coding in an AWGN communication channel using simulation packages.
2. Implementation of adaptive filters, periodogram and multistage multirate system in DSP processor
3. Design and simulate the QMF using simulation packages
4. Antenna radiation pattern measurement of Yagi–Uda, dipole, End-Fire and Broad Side Array antennas.
5. Radiation pattern measurement of micro strip antennas
6. Performance evaluation of digital data transmission through fiber optic link.
8. Design and performance analysis of error control encoder and decoder (CRC and Convolution Codes)
9. Design and simulate the Turbo Coder.
10. Wireless channel equalizer design using DSP (LMS and RLS)
11. Implementation of linear and cyclic codes.
12. Performance evaluation of simulated CDMA system
### Courses of Study for ME I Semester under Regulations 2015

**Sona College of Technology, Salem**  
(An Autonomous Institution)

**Electronics and Communication Engineering**  
Branch: M.E. VLSI Design

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Approved by  
Chairman, Electronics and Communication Engineering BOS  
Dr. R.S. Sabeenian  
Member Secretary, Academic Council  
Dr. R. Shivakumar  
Chairperson, Academic Council & Principal  
Dr. M. Usha

Copy to:-  
HOD/ECE, First Semester ME VLSI Students and Staff, COE

08.08.2017  
Regulations-2015
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<td>1. Comprehend main concepts and propositions of fuzzy logic principles.</td>
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<td>2. Apply the various methods of matrix factors to solve the engineering problems.</td>
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<td>3. Use the decompositions of the matrix and rank reducing approximations for engineering applications.</td>
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<td>4. Apply and analyze the dynamic programming for problem solving.</td>
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<td>5. Analyze problem solving capability of queuing models.</td>
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**REFERENCE BOOKS**

COURSE OUTCOMES
At the end of each unit, the students will be able to -

1. Design and apply standard DSP and other DSP systems used in ICs.
2. Design and illustrate the concepts of DSP systems, DFT, FFT and DCT.
3. Design the digital filters IIR and FIR for signal processing applications.
4. Examine and synthesize the DSP architectures and implement it on PEs and bit serial PEs.
5. Design and evaluate recent trends in DSP processors and system design.

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<th>OUTCOMES</th>
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</table>

Total: 45

REFERENCE BOOKS

### COURSE OUTCOMES

At the end of each unit, the students will be able to -

1. Design and analyze the synchronous sequential circuits.
2. Design and analyze synchronous sequential circuits using ASM.
3. Design and analyze asynchronous sequential circuits.
4. Analyze and verify variable entered maps.
5. Design system controllers using combinational and sequential circuits.

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<th>UNIT</th>
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<th>SYNCHRONOUS SEQUENTIAL CIRCUIT DESIGN</th>
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<td>Structure and Operation of Asynchronous Sequential Networks – Analysis of Asynchronous Sequential Circuit – Races and Hazards in Asynchronous Sequential Networks – Primitive Flow Table – Reduction of Input Restricted Flow Tables – Flow Table Reduction – State Assignment Problem and the Transition Table - Design of Asynchronous Sequential Circuits.</td>
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<th>SYSTEM CONTROLLERS USING COMBINATIONAL AND SEQUENTIAL CIRCUITS</th>
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Total: 60

### REFERENCE BOOKS

### COURSE OUTCOMES
At the end of each unit, the students will be able to -

1. Illustrate the VLSI design and fabrication processes of MOSFETs.
2. Describe and evaluate the MOSFET operations and modeling of MOSFETS.
3. Analyze and evaluate the static and switching characteristics of CMOS inverters.
4. Design combinational and sequential logic circuits using CMOS principles.
5. Write the programming codes, simulate and implement CMOS logic circuits using Verilog HDL.

#### UNIT I  INTRODUCTION AND FABRICATION OF MOSFETS

#### UNIT II  MOS TRANSISTORS AND IT'S MODELING USING SPICE

#### UNIT III  MOS INVERTERS AND CHARACTERISTICS

#### UNIT IV  COMBINATIONAL AND SEQUENTIAL CMOS LOGIC CIRCUITS

#### UNIT V  VERILOG HARDWARE DESCRIPTION LANGUAGE

**Total: 45**

### REFERENCE BOOKS

## COURSE OUTCOMES
At the end of each unit, the students will be able to -

1. Comprehend and analyze MOSFET device operation and RF modeling.
2. Analyze and illustrate the modeling technique for noise and its distortion.
3. Design and analyze the modeling of BSIM4 MOSFET models.
4. Design and evaluate the EKV model and other MOSFET models.
5. Analyze the modeling of passive devices and quality assurance of MOSFET models.

### UNIT I MOSFET DEVICE PHYSICS, OPERATION AND RF MODELING

### UNIT II NOISE MODELING AND DISTORTION ANALYSIS

### UNIT III BSIM4 MOSFET MODEL

### UNIT IV OTHER MOSFET MODELS

### UNIT V MODELING OF PASSIVE DEVICES, PROCESS VARIATION AND QUALITY ASSURANCE OF MOSFET MODELS

Total: 45

### REFERENCE BOOKS
COURSE OUTCOMES
At the end of each unit, the students will be able to -

1. Analyze the modeling of faults and types of simulation for testing circuits and systems.
2. Design and analyze test generation of combinational circuits and testable designs.
3. Design and analyze test generation of sequential circuits and testable designs.
4. Design and evaluate the test pattern generation of Built In Self Test.
5. Synthesize and analyze different fault diagnosis in combinational and sequential circuits.

UNIT I
TESTING AND FAULT MODELLING

UNIT II
TEST GENERATION OF COMBINATIONAL CIRCUITS

UNIT III
TEST GENERATION OF SEQUENTIAL CIRCUITS

UNIT IV
BUILT IN SELF-TEST

UNIT V
FAULT DIAGNOSIS

REFERENCE BOOKS
COURSE OUTCOMES

At the end of the experiments, the students will be able to -

1. Design and analysis the digital systems using Verilog HDL.
2. Verify the characteristics of MOSFET.
3. Implement the digital system design in FPGA Board and analyze the same for performance.
4. Design the NMOS, CMOS Logic circuits and analyze the characteristics of the same.

LIST OF EXPERIMENTS

1. Design of NMOS and CMOS Inverters - DC and transient characteristics and switching times.
2. Design of CMOS logic gate circuits.
   i) Static logic
   ii) Dynamic logic
   iii) Domino logic
3. Design of combinational circuits using Verilog and implement in FPGA.
   i) Multiplexer and De-Multiplexer
   ii) Encoder and Decoder
   iii) Comparator
4. Design of sequential circuits using Verilog and implement in FPGA.
   i) Shift Registers
   ii) Counters
5. Design and implementation of ALU using FPGA and Verilog HDL.
6. Design of FIR filters using FPGA and Verilog HDL.
7. Design of the multiplier using FSM.
8. Model a sequence detector to checks three consecutive one’s and verify the same using test bench.
9. Design and implementation of traffic controller using FPGA.
Sona College of Technology, Salem  
(An Autonomous Institution)  
Courses of Study for ME I Semester under Regulations 2015  
Computer Science and Engineering  
Branch: M.E. Computer Science and Engineering

<table>
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Total Credits 19

Approved by

Chairperson, Computer Science and Engineering BOS  
Dr.M.Usha  
Member Secretary, Academic Council  
Dr.R.Shivakumar  
Chairperson, Academic Council & Principal  
Dr.M.Usha  

Copy to:-  
Dean/CSE, First Semester ME CSE Students and Staff, COE

08.08.2017  
Regulations-2015
COURSE OUTCOMES
After successful completion of the course, the students would be able to,

- Discuss the concepts of set theory, principle of inclusion and exclusion ,relations and describe the concepts of permutations and combinations using binomial and multinomial theorems
- Explain the concept of recurrence relations and calculating the coefficients of generating functions and find the solutions of homogeneous and in homogeneous recurrence relations.
- Define the graph and explain their behavior and properties .Calculate the shortest path and minimal spanning tree by using algorithms.
- Discuss the matching and connectivity of a graph. Explain the network flow problems and describe the 1-isomorphic and 2-isomorphic graphs.
- Discuss the coloring and chromatic number of a graph and Euler’s formula. Explain planar graphs and parameters of planarity and Hamiltonian cycles.

COMBINATORICS


Unit – II: RECURRENT RELATIONS: Generating Functions of Sequences- Calculating Coefficients of Generating Functions- Recurrence Relations- Solving Recurrence Relations by Substitution and Generating Functions-Method of Characteristic Roots-Solutions of homogeneous and inhomogeneous recurrence relations.

GRAPH THEORY

Unit III: Fundamental concepts on Graph -Paths-Cycles-Trails-Vertex Degrees and Counting-Directed Graphs-Trees and Distance- Shortest path algorithm(Dijkstra’s&Warshall’s algorithm) -Spanning Trees-Enumeration-Optimization and Trees(Prim’s&Kurskal’s algorithm).


Note: From Unit I to Unit V – Theorem providing is not part of the syllabus. Only applications of theorems (problem solving) are considered.

Total : 60 hours
REFERENCES:
1. Graph Theory with Applications to Engineering and Computer Science, Narasingh Deo, PHI.
3. Douglas B. West, "Introduction to Graph Theory", Pearson Education Asia, New Delhi. (Chapters 1, 2, 3, 4, 5, 6, 7)
5. Robin J. Wilson, "Introduction to Graph Theory" Pearson Education Asia, New Delhi.
COURSE OUTCOMES
After successful completion of the course, the students would be able to,

- Analyze algorithms and to determine algorithm correctness and time efficiency class.
- Master a variety of advanced data structures and their implementations.
- Master different algorithm design techniques in computational geometry and in parallel algorithms.
- Apply and implement learned algorithm design techniques and data structures to solve problems.

UNIT I  FUNDAMENTALS
(9)

UNIT II  HEAP STRUCTURES
(9)

UNIT III  SEARCH STRUCTURES
(9)

UNIT IV  MULTIMEDIA STRUCTURES
(9)

UNIT V  PARALLEL ALGORITHMS
(9)

Total: 45 hours

REFERENCE BOOKS:
COURSE OUTCOMES
After successful completion of the course, the students would be able to
- Analyse theory and implementation of: processes, resource control and process scheduling
- Analyse theory and implementation of: physical and virtual memory, I/O and files
- describe, contrast and compare differing structures for operating systems
- analyze the various algorithms used for mutual exclusion in distributed systems
- describe and analyze the design of modern operating systems

UNIT I  PROCESS MANAGEMENT  (9)
Operating system and services - Process structure and PCB - Threads – Inter process communication – CPU scheduling approaches - Process synchronization — Deadlocks.

UNIT II  MEMORY AND FILE MANAGEMENT  (9)

UNIT III  DISTRIBUTED OPERATING SYSTEM  (9)

UNIT IV  DISTRIBUTED SCHEDULING AND MEMORY  (9)

UNIT V  REAL TIME AND MOBILE OPERATING SYSTEMS  (9)

Total: 45 hours

REFERENCE BOOK
After successful completion of the course, the students would be able to,

- Comprehend the basic concepts of networking
- Analyze the various characteristics of network and transport layers
- Analyze the various network design strategies
- Test the various network design strategies
- Analyze the working principle and performance of various network management protocols.

UNIT I  FOUNDATIONS OF NETWORKING


UNIT II ROUTING AND QUALITY of SERVICE


UNIT III NETWORK DESIGN

Analyzing top-down network design methodologies, technical goals and tradeoffs – scalability, reliability, availability, Network performance, security, Characterizing the existing internetwork, characterizing network traffic, developing network security strategies.

UNIT IV TESTING AND OPTIMIZING SYSTEM DESIGN

Selecting technologies and devices for network design, testing network design – using industry tests, building a prototype network system, writing and implementing test plan, tools for testing, optimizing network design – network performance to meet quality of service (QoS)

UNIT V NETWORK MANAGEMENT

SNMP– SNMPv2 and SNMPv3 – Remote monitoring – RMON SMI and MIB

REFERENCE BOOKS:


Total: 45 hours
COURSE OUTCOMES
After successful completion of the course, the students would be able to

- Analyze the potential data hazards in the given code and suggest a way to eliminate them.
- Discuss how cache coherence problems are overcome in directory-based protocols.
- Design a strictly non blocking multi stage Clos network for given number of channels
- Explain the architecture and compare SMT processors with multi-core processors
- Find average memory access time for the given hit time, miss rate and miss penalty.
- Evaluate the tradeoffs of software and hardware approaches of TLB misses.
- Design a unique memory system based on the concepts studied.

UNIT I   PIPELINING AND ILP  

UNIT II   TLP AND LIMITS OF ILP  

UNIT III  MULTIPROCESSOR SYSTEMS  

UNIT IV  MULTI-CORE ARCHITECTURES  

UNIT V  MEMORY HIERARCHY DESIGN  
Introduction - Optimizations of Cache Performance - Memory Technology and Optimizations - Protection: Virtual Memory and Virtual Machines - Design of Memory Hierarchies - Case Studies.

TOTAL:45 hours

REFERENCE BOOKS:
COURSE OUTCOMES
After successful completion of the course, the students would be able to

- Implement multi-dimensional data structures
- Implement Exhaustive Search techniques.
- Implement the Tree Structures
- Implement Multimedia structures
- Implement Scheduling, Page-replacement and IPC

LIST OF EXPERIMENTS:

1. Implementation of multi-dimensional structures such as matrices, triangular matrices, diagonal matrices, etc into a one dimensional array (atleast any two)
2. Implementation of any two of the following Heap structures
   Deaps (Insertion, Delete Min, Delete Max)
   Leftist Heap (All Meldable Priority Queue operations)
   Skew Heap (All Meldable Priority Queue operations)
   Fibonacci Heap (All Meldable Priority Queue operations)
3. Implementation of any two of the following Search Structures
   AVL Trees (Insertion, Deletion and Search)
   Splay Trees (Insertion, Deletion and Search)
   Tries for any specified alphabet (Insertion, Deletion and Search)
   B-Trees (Insertion, Deletion and Search)
4. Implementation of any two of the following multimedia structures
   2-d Trees (Insertion, Deletion and Range Queries)
   Point Quad-Trees (Insertion, Deletion and Range Queries)
   Segment Trees (Insertion, Deletion – Show list of nodes where in insertion and deletion took place)
5. Finding Convex-hull.
6. Implementation of CPU Scheduling algorithms
   FCFS
   SJF
   Priority
   Round robin
7. Implementation of page replacement algorithms
   FIFO
   LRU
8. Inter-process communication using semaphores

TOTAL: 30 hours
COURSE OUTCOMES
After successful completion of the course, the students would be able to
- Simulate various LAN Topologies and MAC protocols
- Simulate different routing protocols
- Simulate AODV in wireless environment
- Simulate the TCP congestion control mechanisms
- Analyze the incoming packet structures using ‘pcap’ library

LIST OF EXPERIMENTS
1. Create a LAN Network and compare the performance between MAC protocols using ns-2
2. Simulate DVR and LSR routing using ns-2
3. Create a wireless network environment with mobile nodes and transfer the data using AODV using ns-2
4. Create a TCP based network and trace the performance of Slow Start congestion control algorithm using ns-2
5. Filter the incoming packets based on IP address using “pcap” or “jpcap” library
6. Extract the network layer details of the incoming packets using “pcap” library.
7. Extract the MAC address of the incoming packet using “pcap” library.
8. You are to write a Python network server program that will accept an unlimited number of connections, one at a time. Upon receiving a connection, it should send back to the client the client’s IP address. Then it should wait for commands from the client. Valid commands are “TIME”, “IP” and “EXIT”. To the TIME command, the server should return the current time (see Example of obtaining a time string). To the IP command, it should again return the client’s IP address. If the client closes the connection or does not respond with a command in a reasonable time (10 seconds), the server should close the current connection and wait for another connection (see Setting a timeout on a socket). To the EXIT command, your server should close all open sockets and exit. Below are two client programs for purposes of testing your server. Feel free to modify the client programs as needed while testing your server.

IP_client.py
IP_client_2.py

TOTAL: 30 hours
COURSE OUTCOMES

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

- Goal setting and time and stress management that deals with criticism.
- Develop team work skills and leadership qualities.
- Analyze to prioritize, plan and delegate work.
- Develops good presentation skills, skills to discuss effectively in a group and in public.
- Demonstrate the interview techniques and manage the frequently asked questions
- Explore and practice different etiquette and manners.

Unit I:

SWOT analysis and goal setting, Intra-personal skills, Interpersonal Skills, Time Management, Stress Management, Dealing with Criticism

Unit II:

Team Work, Leadership skills, Prioritizing and Planning, and Delegation.

Unit III:

Presentations Skills, Group Discussion, Public Speaking skills.

Unit IV:

Career Planning, Resume Writing, Interview Techniques.

Unit V:

Etiquette and Manners: Workplace Etiquette, Grooming Etiquette, Social Etiquette, Table manners and Etiquette, E-Mail Etiquette.

Total : 30 hours
### Courses of Study for ME I Semester under Regulations 2015

**Information Technology**  
**Branch: M.Tech. Information Technology**

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**Total Credits**: 23

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**Chairperson, Information Technology BoS**  
Dr. J. Akilandeswari

**Member Secretary, Academic Council**  
Dr. R. Shivakumar

**Chairperson, Academic Council & Principal**  
Dr. M. Usha

Copy to:-
HOD/IT, First Semester M.Tech IT Students and Staff, COE
P15MIT101 THEORETICAL FOUNDATIONS OF COMPUTER SCIENCE 3 2 0 4

COURSE OUTCOMES

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

1. Explain the concepts of set theory, relations, function, types of functions and apply the concepts to solve problem
2. Define and explain symbolic logic, construct truth tables and discuss the validity of the arguments
3. Apply predicates and solve the complicated logical problems
4. Compute theoretical models using automata theory and to identify formal languages
5. Explain the concepts of different terminologies in graph theory and apply them to solve problems in describing relations among modules

UNIT – I FUNDAMENTAL STRUCTURES


UNIT - II LOGIC

Propositional logic – Logical connectives – Truth tables – Normal forms (conjunctive and disjunctive) – Predicate logic – Universal and existential quantifiers – Proof techniques – direct and indirect – Proof by contradiction

UNIT – III COMBINATORICS

Sum-rule, Product-rule, Permutations, Combinations, Mathematical Induction, Pigeon-hole Principle, Principle of inclusion- exclusion, Recurrence Relations, Generating Functions

UNIT – IV MODELING COMPUTATION AND LANGUAGES

Finite state machines – Deterministic and Non-deterministic finite state machines – Turing Machines – Formal Languages – Classes of Grammars – Type 0 – Context Sensitive – Context Free – Regular Grammars – Ambiguity

UNIT – V GRAPHS

Introduction to Graphs-Graph terminology-Representation of Graphs-Graph Isomorphism-Connectivity-Euler and Hamilton Paths-Connectedness in Directed Graphs-Shortest Path Algorithms-Spanning Trees-Minimum Spanning Tree-Rooted and Binary Trees

Tutorial: 30 hours
Total: 75 hours

REFERENCES

P15MIT102  ADVANCED DATA STRUCTURES AND ALGORITHMS      3 0 0 3

COURSE OUTCOMES

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

1. Explain the role of algorithms in real world problems and represent algorithmic time complexity using asymptotic notations
2. Explain and the apply the operations of hierarchical data structures such as BST, red-black trees, B-trees and heap
3. Explain and implement the graph algorithms
4. Explain the algorithmic design methodologies like dynamic programming and greedy approach
5. Characterize the problems as NP complete, NP hard and NP

UNIT I  ROLE OF ALGORITHMS IN COMPUTING


UNIT II  HIERARCHICAL DATA STRUCTURES


UNIT III GRAPHS


UNIT IV  ALGORITHM DESIGN TECHNIQUES


UNIT V  NP COMPLETENESS AND APPROXIMATION ALGORITHMS


Total : 45 hours

REFERENCES

COURSE OUTCOMES
At the end of the course, the student will be able to
1. Explain the concept of parallelism and overcoming data hazards with dynamic scheduling
2. Apply the different compiler techniques to implement the instructions level parallelism and compare hardware versus software speculation concepts
3. Explain symmetric and distributed shared memory architectures and models of memory consistency
4. Analyze the different Multi-core architecture and measure the different multi-core architecture performance
5. Explain the concept of memory hierarchies, virtual memory and virtual machines

UNIT I PIPELINING AND ILP

UNIT II TLP AND LIMITS OF ILP

UNIT III MULTIPROCESSOR SYSTEMS

UNIT IV MULTI-CORE ARCHITECTURES

UNIT V MEMORY HIERARCHY DESIGN
Introduction - Optimizations of Cache Performance - Memory Technology and Optimizations - Protection: Virtual Memory and Virtual Machines - Design of Memory Hierarchies - Case Studies.

Total: 45 hours

REFERENCES
P15MIT104 SOFTWARE ENGINEERING METHODOLOGIES 3 0 0 3

COURSE OUTCOMES

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

1. Apply a suitable SDLC model for the software to be developed based on the scope and requirements of software engineering in IT industry

2. Explain the object-oriented methodologies and workflows and apply object-oriented principles, techniques, appropriate UML models, and other artifacts to construct a design for a real-world problem

3. Analyze system requirements to determine the use cases and domain model of the problem domain and describe the classification techniques of objects

4. Apply different software testing methodologies to make defect free software

5. Apply reengineering process to do alteration in the developed software

UNIT I  THE PROCESS  9


UNIT II  REQUIREMENTS ANALYSIS  9

Requirements Engineering- tasks – Initialization the Requirement Engineering process - Eliciting requirements-Building the requirements model-Validating Requirements - Requirements analysis- Model Approaches – Data Modeling Concepts- Class Based Modeling - Behavioral Model

UNIT III DESIGN CONCEPTS AND PRINCIPLES  9

The Design concepts - The Design model-Architectural design-Designing Class Based Components - User interface design: user analysis and design, Interface analysis, Interface design steps- Software risk management,

UNIT IV TESTING TECHNIQUES AND MANAGEMENT  9

Software testing – Path testing – Control structures testing – Black Box testing – Unit, Integration, Validation and system testing – SCM

UNIT V TRENDS IN SOFTWARE ENGINEERING  9

Software Re-engineering- Metrics for Process and Projects- Case Study of CASE tools.

Total : 45 hours

REFERENCES


COURSE OUTCOMES
At the end of the course, the student will be able to
1. Describe various types of protocol architecture and apply IPv4 address classes for subnetting
2. Select and apply appropriate protocols for high speed networks
3. Apply various congestion control and link control mechanisms for traffic management
4. Apply various queuing disciplines to achieve QoS
5. Describe various Protocols for QoS support

UNIT I PROTOCOLS AND TCP/IP SUITE

UNIT II HIGH SPEED NETWORKS

UNIT III CONGESTION AND TRAFFIC MANAGEMENT

UNIT IV QUALITY OF SERVICE IN IP NETWORKS

UNIT V PROTOCOLS FOR QoS SUPPORT

Practical: 30 hours
Total: 75 hours

REFERENCES
Lab Exercises:

1. Installation and study of Network Simulator ns-2 commands.
2. Simulation of four node wired network and data transfer with TCP agent using ns-2
3. Simulation of dumbbell topology and data transfer with TCP agent using ns-2
4. Simulation of Ethernet LAN using n-nodes
5. Creation of congestion in wired network using ns-2
7. Implementation of Distance Vector Routing Protocol using ns-2
8. Generation of X graph for Packet Delivery Ratio, Throughput and Delay
9. Creation of DDOS attack in ns-2
P15MIT106 DISTRIBUTED SYSTEMS 3003

COURSE OUTCOMES
At the end of the course, the student will be able to
1. Explain the distributed systems concepts and deployment of large scale distributed systems
2. Explain in detail about network visualization and remote invocations required for distributed system
3. Evaluate the distributed algorithms for locking, synchronization and concurrency, scheduling and replication
4. Identify the security challenges faced by distributed system programs
5. Describe the appropriate solutions to meet the needs of commonly encountered distributed programming scenarios

UNIT I INTRODUCTION AND PROCESSES

UNIT II COMMUNICATION AND NAMING

UNIT III SYNCHRONIZATION AND CONSISTENCY AND REPLICATION

UNIT IV FAULT TOLERANCE AND SECURITY

UNIT V CASE STUDIES
Distributed File Systems - Distributed Web-Based Systems

Total: 45 hours

REFERENCES:
COURSE OUTCOMES
At the end of the course, the student will be able to
1. Implement the tree data structure
2. Implement graph algorithms
3. Implement problems in greedy and approximation approach

Experiments
1. Implementation of Binary Search Tree
2. Implementation of Fibonacci Heaps
3. Implementation of Red-Black tree
4. Implementation of Spanning Tree
5. Implementation of Shortest Path Algorithms
6. Implementation of Graph Traversals
7. Implementation of Greedy Algorithms
8. Implementation of
9. Approximation Algorithms