SCHEME OF INSTRUCTION & EXAMINATION  
(Regulation R17)  
M.TECH (STRUCTURAL ENGINEERING)  
DEPARTMENT OF CIVIL ENGINEERING  
(With effect from **2017-2018** Admitted Batch onwards)  
Under Choice Based Credit System  

### I-SEMESTER

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ADVANCED MATHEMATICS

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COURSE OBJECTIVES:
1. Second order partial differentiation that arise in applications such as one-dimensional heat equation and two-dimensional laplace equation and their solution by both analytical as well as numerical methods.
2. In detail about correlation and regression. Also learn certain tests of significance.
3. About linear programming, methods of solutions such as simplex method. Certain aspects of non-linear programming.

COURSE OUTCOMES:
Upon completion of this course, the student will be able to
1. Obtain analytical solution of the two-dimensional partial differentials they come across in simple applications.
2. Get numerical solutions for One – dimensional heat and two-dimensional laplace equations by different methods.
3. Perform correlation and regression analysis for different types of data they come across.
4. Formulate a linear programming problem and solve it by an appropriate method. Analyse non-linear programming problems by some specific methods.

SYLLABUS

UNIT-I

UNIT-II

UNIT-III
UNIT-IV
Tests of significance – Analysis of variance for regression – Multiple correlation coefficients – Multiple linear regression with two independent variables.

UNIT-V
Linear Programming Problem Formation, Graphical Method, Simplex method, artificial variable method-Big-M method-Two Phase Method.
Non Linear Programming Problem Gradient method, Steepest Ascent Descent Methods

TEXT BOOKS
2. Introductory Methods of Numerical Analysis – Sastry, S.S.

REFERENCE BOOKS
COURSE OBJECTIVE:

1. This subject is taught to impart knowledge on theory of elasticity.

COURSE OUTCOMES:

Upon completion of this course, the student will be able to

1. Analyze the stresses and strains for two dimensional and three dimensional elements.
2. Understand the equilibrium and compatibility conditions.
3. Solve the problems on Torsion for different shaped bars.

SYLLABUS

UNIT-I


UNIT-II

Two dimensional problems in rectangular co-ordinates – Solution by polynomials – Saint Venant’s principle – Determination of displacements – Bending of simple beams – Application of Fourier series for two dimensional problems for gravity loading

UNIT-III

Two dimensional problems in polar co-ordinates - General equations in polar co-ordinates – Stress distribution for problems having symmetrical about an axis - Strain components in polar co-ordinates – Displacements for symmetrical stress distributions - Stresses for plates with circular holes subjected to far field tension – stress concentration factor.

UNIT-IV

UNIT-V
Torsion of prismatical bars – Bars with elliptical cross section – Other elementary solution – Membrane analogy – Torsion of rectangular bars – Solution of torsional problems by energy method.

TEXT BOOK:


REFERENCE BOOKS:

3. “Advanced Strength of Materials” by Denhortic, Dover publications
# COURSE OBJECTIVES:

The main objectives of this Course is

1. To prepare the students to have a basic knowledge in the matrix methods such as flexible matrix method and Stiffness matrix method.
2. To prepare the students to analyze the beams by matrix methods.
3. To prepare the students to analyze the Plane truss problems by matrix methods.
4. To prepare the students to analyze the Plane Frames by matrix methods.

# COURSE OUTCOMES:

After completion of course students should be able to

1. Analyze various beams by the matrix methods at different loading conditions.
2. Analyze various Plane truss problems by the matrix methods.
3. Analyze Plane Frames by the matrix methods at different loading conditions.

# SYLLABUS

## UNIT-I


## UNIT-II

Stiffness method – Element and global stiffness equation – coordinate transformation and global assembly – structure stiffness matrix equation – analysis of simple pin jointed trusses – continuous beams– rigid jointed plane frames

## UNIT-III


## UNIT-IV

UNIT-V
Space trusses and frames - Member stiffness for space truss and space frame– Transformation matrix from Local to Global – Analysis of simple trusses, beams and frames

TEXT BOOKS:
2. Matrix Analysis of framed Structures-W Weaver& Gere, Van Nostrand Reinhold Company

REFERENCE BOOKS:
COURSE OBJECTIVES:
The main objectives of this Course is
1. To find the behavior of structures subjected to dynamic loads such as wind, earthquake and blast loads.
2. To study the different Dynamic analysis procedures for calculating the response of structures.

COURSE OUTCOMES:
After completion of course students should be able to
1. Solve the problems on Single degree of freedom.
2. Understand the difference between harmonic loading and impulse loading and the related analysis procedures.
3. Evaluate the structural properties, mode shapes for different structures.

SYLLABUS

UNIT-I
Introduction to Structural Dynamics: Fundamental objective of Dynamic analysis – Types of prescribed loadings – methods of Discretization – Formulation of the Equations of Motion.

UNIT-II

UNIT-III

UNIT-IV
UNIT-V

TEXT BOOK:

REFERENCE BOOKS:
1. “Structural Analysis” by A. Ghali & A.M. Neville, CRC Press
2. Dynamics of Structures by Anil Kumar Chopra, Pearson Prentice Hall
3. Dynamics of Structures by Clough & Penzien.
COURSE OBJECTIVES:
The main objectives of this Course is
1. To emphasize the importance of soil sampling and site investigations.
2. To explain the safe bearing capacity and proportioning of Shallow Foundations.
3. To explain in what circumstances pile is needed and how to do analysis of pile and pile group under various soil conditions.

COURSE OUTCOMES:
After completion of course students should be able to
1. Plan a detailed soil exploration programme.
2. Apply various methods for estimating bearing capacity of different types of foundations.
3. Estimate load capacity of single piles and groups of piles

SYLLABUS

UNIT-I
Soil Exploration – Importance, Terminology, planning - Geophysical methods. Borings, location, spacing and depth, methods of boring including drilling, stabilization of boreholes, boring records.

UNIT-II
Soil sampling – Methods of sampling -Types of samples and samplers-cleaning of bore holes, preservation, labeling and shipment of samples - Design considerations of open drive samplers.

UNIT-III
Shallow Foundations –Bearing capacity – General bearing capacity equation, Meyerhof’s, Hansen’s and Vesic’s bearing capacity factors - Bearing capacity of stratified soils - Bearing capacity based on penetration resistance- safe bearing capacity and allowable bearing pressure. (Ref: IS -2131 & IS 6403)

UNIT-IV
UNIT-V

Pile foundations-Classification of piles-factors influencing choice-Load-carrying capacity of single piles in clays and sands using static pile formulae- $\alpha - \beta$ and $\lambda$ methods—Dynamic pile formulae-limitations-Monotonic and cyclic pile load tests—Under reamed piles.
Pile groups-Efficiency of pile groups-Different formulae-load carrying capacity of pile groups in clays and sands—settlement of pile groups in clays and sands—Computation of load on each pile in a group.

TEXT BOOKS:

1. Principles of Foundation Engineering by Braja M. Das.
2. Soil Mechanics in Engineering Practice by Terzaghi and Peck
4. Analysis and Design of sub structures by Swami Saran

REFERENCE BOOKS:

2. Foundation Design and Construction by MJ Tomlinson—Longman Scientific
3. A short course in Foundation Engineering by Simmons and Menzes—ELBS.
4. Foundation Design by Wayne C. Teng, John Wiley & Co.,
EXPERIMENTAL STRESS ANALYSIS
(ELECTIVE-I)

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COURSE OBJECTIVE:

1. The main objectives of this Course is to impart knowledge about the instruments and its applications.

COURSE OUTCOMES:

Upon completion of this course, the student will be able to

1. Know the working principle of strain gauges.
2. Do the model analysis using different theorems.
3. Know the concepts of photo elasticity and its applications.

SYLLABUS

UNIT-I
Introduction and Strain measurement methods – Model & Prototype– Dimensional analysis- Factors influencing model design – Scale factors and Model material properties – Methods of model design. Definition of strain and its relation to experimental determinations - properties of strain gauge systems – Mechanical, Optical, Acoustic and Pneumatic types.

UNIT-II

UNIT-III

UNIT-IV
UNIT-V


TEXT BOOKS:

2. Experimental Stress Analysis- Sadhu Singh

REFERENCE BOOKS:

**ADVANCED REINFORCED CONCRETE DESIGN**  
*(ELECTIVE-I)*

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**COURSE OBJECTIVES:**
The main objectives of this Course is
1. To Estimate the crack width and deflection with regard to the serviceability.
2. To analyze and design a grid floor system.
3. To analyze and design a flat slab system.
4. To analyze and design of concrete structures against fire resistance, according to ISO 834 standards

**COURSE OUTCOMES:**
After completion of course the students should be ability to
1. Estimate the crack width and deflection with regard to the serviceability.
2. Analyze and design a grid floor system.
3. Analyze and design a flat slab system.
4. Analyze and design of concrete structures against fire resistance, according to ISO 834 standards.

**SYLLABUS**

**UNIT-I**
Deflection of Reinforced Concrete Beams and Slabs: Introduction, Short-term deflection of beams and slabs, Deflection due to imposed loads, Short-term deflection of beams due to applied loads, Calculation of deflection by IS 456, Deflection of continuous beams by IS 456, Deflection of slabs.

**UNIT-II**

**UNIT-III**
Redistribution of Moments in Reinforced Concrete Beams: Introduction, Redistribution of moments in fixed beam, Positions of points of contraflexures, Conditions for moment redistribution, Final shape of redistributed bending moment diagram, Moment redistribution for a two-span continuous beam, Advantages and disadvantages of moment redistribution, Modification of clear distance between bars in beams (for limiting crack width) with redistribution, Moment-curvature (M - ψ), Relation of reinforced concrete sections.
UNIT-IV
Design of Flat Slabs: Introduction, Proportioning of Flat Slabs, Determination of Bending moment and Shear Force, Direct Design method, Equivalent Frame method, Slab Reinforcement.

UNIT-V
Design of Reinforced Concrete Members for Fire Resistance: Introduction, ISO 834 standard heating conditions, Grading or classifications, Effect of high temperature on steel and concrete, Effect of high temperatures on different types of structural members, Fire resistance by structural detailing from tabulated data, Analytical determination of the ultimate bending moment, Capacity of reinforced concrete beams under fire, Other considerations.

TEXT BOOK:


REFERENCE BOOKS:

1. “Reinforced Concrete” by Park & Paulay, Wiley publications.
PLASTIC ANALYSIS AND DESIGN
(ELECTIVE-II)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:
The main objectives of this Course is
1. To familiarize the student on various design principles of plastic analysis and design.

COURSE OUTCOMES:
Upon completion of this course, the student will be able to
1. Analyze the S.S.B and fixed beams by limit design.
2. Design the continuous beams and simple frames.
3. To compute the deflections for S.S.B, fixed portal frames.

SYLLABUS

UNIT -I
Introduction and basic hypothesis: Concepts of stress and strain – relation of steel Moment curvature relation- basic difference between elastic and plastic analysis with examples- Yield condition, idealizations, collapse criteria- Virtual work in the elastic-plastic state-Evaluation of fully plastic moment and shape factors for the various practical sections.

UNIT-II
Method of Limit Analysis: Introduction to limit analysis of simply supported fixed beams and continuous beams, Effect of partial fixity and end, invariance of collapse loads, basic theorems of limit analysis, rectangular portal frames, gable frames, grids, superposition of mechanisms, drawing statistical bending moment diagrams for checks.

UNIT-III
Limit design Principles: Basic principles, limit design theorems, application of limit design theorems, trial and error method, method of combining mechanisms, plastic moment distribution method, load replacement method, continuous beams and simple frames designs using above principles.

UNIT-IV
Deflection in Plastic beams and frames: Load deflection relations for simply supported beams, deflection of simple pin based and fixed based portal frames, method of computing deflections.

UNIT-V
Minimum weight Design: Introduction to minimum Weight and linear Weight functions-Foulkes theorems and its geometrical analogue and absolute minimum weight design.
TEXT BOOKS:

2. Plastic Analysis and Design –C E Messennet, M A Seve

REFERENCE BOOKS:

3. “Design of Steel Structures” Vol2 by Dr.Rama Chandra, Scientific Publications
4. Plastic Methods of Structural analysis- B G Neal, Chapman and Rall publications
ANALYSIS AND DESIGN OF TALL BUILDINGS
(ELECTIVE-II)

Lecture : 3 Periods  Int.Marks : 30
Tutorial : 1 Period.  Ext. Marks : 70
Exam : 3 Hrs.  Credits : 3

COURSE OBJECTIVES:
The main objectives of this Course is
1. This course is intended to teach the concept of tall structures.
2. Various methods to analyze the tall structure will be explained in the classes.

COURSE OUTCOMES:
Upon completion of this course, the student will be able to
1. Know the types of tall buildings.
2. Analyze the plane frame systems by different methods.

SYLLABUS

UNIT-I
Design Criteria Philosophy, Materials – Modern concepts – High Performance Concrete, Fibre Reinforced Concrete, Light weight concrete, Self Compacting Concrete

UNIT-II

UNIT-III
Behavior of Structural Systems- Factors affecting the growth, height and structural form, Behaviour of Braced frames, Rigid Frames, In-filled frames, Shear walls, Coupled Shear walls, Wall–Frames, Tubular, Outrigger braced, Hybrid systems.

UNIT-IV

UNIT-V
TEXT BOOKS:

3. “Reinforced Concrete Structures” by Park, R. &Paulay, T, Wiley publications

REFERENCE BOOKS:

REPAIR AND REHABILITATION OF STRUCTURES
(ELECTIVE-II)

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COURSE OBJECTIVES:
1. To familiarize the students with various types of deteriorations and need for rehabilitation.
2. To familiarize the student with Non – destructive testing and repairs.

COURSE OUTCOMES:
Students will be able to
1. Assess the damage intensity.
2. Select proper rehabilitation and repair measures for different types of deteriorations.
3. Apply the Seismic Retrofitting techniques on reinforced concrete building.

SYLLABUS

UNIT-I

UNIT-II
Strengthening and stabilization- Techniques- design considerations-Beam shear capacity strengthening- Shear Transfer strengthening-stress reduction techniques- Column strengthening-flexural strengthening- Connection stabilization and strengthening, Crack stabilization.

UNIT-III
Bonded installation techniques- Externally bonded FRP- Wet layup sheet, bolted plate, near surface mounted FRP, fundamental debonding mechanisms-intermediate crack debonding-CDC debonding- plate end debonding- strengthening of floor of structures.

UNIT-IV
UNIT-V
High performance concretes- Introduction- Development of high performance concretes-
Materials of high performance concretes-Properties of high performance concretes- Self
Consolidating concrete-properties-qualifications.

TEXT BOOKS:

REFERENCE BOOKS:
1. Concrete technology- Neville & Brooks
2. Special Structural concrete- Rafat Siddique
3. Concrete repair and maintenance illustrated- Peter H Emmons
4. Concrete technology-M S Shetty
COURSE OBJECTIVES:
1. To Apply the knowledge in strain measurement, SCC, Chemical analysis of water and aggregate.
2. To familiarize the student with Non – destructive tests on hardened concrete.

COURSE OUTCOMES:
Students will be able to
1. Measure strains in concrete elements by Electrical resistance strain gauges.
2. Conduct qualifying tests for Self compaction concrete.
3. Conduct Chemical Analysis of water and Aggregate for Suitabilityin concreting with and without Reinforcement.

SYLLABUS
1. Strain measurement - Electrical resistance strain gauges
2. Non destructive testing- Impact Hammer test, UPV test
3. Qualifications tests on Self compaction concrete-LBox test, J Box test, U box test, Slump Test.
4. Tests on Buckling of columns – Southwell plot
5. Repair and rehabilitation of concrete beams
6. Chemical Analysis of water for suitability in concreting with and without Reinforcement.
7. Chemical Analysis of sand and Aggregate for Suitability in Construction.

NOTE: A minimum of five experiments from the above set have to be conducted.

REFERENCE BOOKS:
2. Concrete technology- Neville & Brooks
3. Concrete technology-M S Shetty
SCHEME OF INSTRUCTION & EXAMINATION  
(Regulation R17)

M.TECH (STRUCTURAL ENGINEERING)  
DEPARTMENT OF CIVIL ENGINEERING

(With effect from 2017-2018 Admitted Batch onwards)  
Under Choice Based Credit System

II-SEMESTER

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THEORY OF PLATES AND SHELLS

Lecture : 3 Periods  Int.Marks : 30
Tutorial : 1 Period.  Ext. Marks : 70
Exam : 3 Hrs.  Credits : 3

COURSE OBJECTIVES:

1. To familiarize with the concepts of plates and shells and designing of shells.

COURSE OUTCOMES:

Students will be able to
1. Analyze and design for plates for different loadings.
2. Analyze and design of shells.
3. Explain the concept of theory of cylindrical shells.

SYLLABUS

UNIT-I
Derivation of governing differential equation for plate— in plane bending and transverse bending effects- Rectangular plates: Plates under various loading conditions like concentrated, uniformly distributed load and hydrostatic pressure. Navier and Levy’s type of solutions for various boundary condition.

UNIT-II
Circular plates: Symmetrically loaded, circular plates under various loading conditions, Annular plates.

UNIT-III

UNIT-IV
Cylindrical Shells: Derivation of the governing DKJ equation for bending theory, details of Schorer’s theory. Application to the analysis and design of short and long shells. Use of ASCE Manual coefficients for the design.

UNIT-V
Beam theory of cylindrical shells: Beam and arch action. Design of diaphragms - Geometry analysis and design of elliptic Paraboloid, Conoidal and Hyperbolic Paraboloid shapes by membrane theory.
TEXT BOOK:
1. Theory of Plates and Shells” by Timoshenko, S. and Wernewsky-Kriegar, McGraw Hill Co

REFERENCE BOOKS:
2. K. Chandra Sekhara
3. A Text Book of Plate Analysis – Bairagi, K, Khanna Publisher, New Delhi.
FINITE ELEMENT METHODS OF ANALYSIS

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COURSE OBJECTIVES:

1. To apply the concepts of Finite element method for solving structural Engineering problems.

COURSE OUTCOMES:

Students will be able to

1. Understand the fundamentals of Finite element method.
2. Derive the solution of the problems of 1D and 2D by FEM.
3. Apply the concept of iso-parametric formulation for solving problems.
4. Derive the shape functions for higher order elements.

SYLLABUS

UNIT-I

UNIT-II


UNIT-III

Finite element formulation of Beam elements: Beam stiffness-assemblage of beam stiffness matrix- Examples of beam analysis for concentrated and distributed loading- Galerkin’s method - 2-D Arbitrarily oriented beam element – inclined and skewed supports – rigid plane frame examples

UNIT-IV

Finite element formulation for plane stress, plane strain and axisymmetric problems- Derivation of CST and LST stiffness matrix and equations-treatment of body and surface forces-Finite Element solution for plane stress and axisymmetric problems- comparison of CST and LST elements –convergence of solution- interpretation of stresses
UNIT-V


TEXT BOOKS :

1. Introduction to Finite element Method by TirupathichandraPatla and Belugundu, PHI

REFERENCE BOOKS:

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

Lecture: 3 Periods  Int. Marks: 30
Tutorial: 1 Period.  Ext. Marks: 70
Exam: 3 Hrs.  Credits: 3

COURSE OBJECTIVES:
1. To impart the knowledge of designing earthquake resistant structures and familiarize the codeprovisions.

COURSE OUTCOMES:
Students will be able to
1. Describe various terms of engineering seismology.
2. Design earthquake-resistant structures.
3. Gain the knowledge on seismic code provisions and detailing.
4. Acquire the knowledge in structural irregularities in seismic planning and shear wall concept.

SYLLABUS

UNIT-I
Engineering seismology – rebound theory – plate tectonics – seismic waves - earthquake size and various scales – local site effects – Indian seismicity – seismic zones of India – theory of vibrations – near ground and far ground rotation and their effects.

UNIT-II

UNIT-III
Calculation of EQ load – 3D modeling of building systems and analysis (theory only) Design and ductile detailing of Beams and columns of frames Concept of strong column weak beams, Design and ductile detailing of shear walls

UNIT-IV
Cyclic loading behavior of RC, steel and pre-stressed concrete elements - modern concepts- Base isolation – Adaptive systems – case studies.
UNIT-V

Retrofitting and restoration of buildings subjected to damage due to earthquakes – effects of earthquakes – factors related to building damages due to earthquake – methods of seismic retrofitting – restoration of buildings.

TEXT BOOKS:
3. “Earthquake resistant design of structures” by S.K. Duggal, Oxford University Press

REFERENCE BOOKS
3. Relevant code of practices.
COURSE OBJECTIVES:
1. To impart the knowledge on linear and nonlinear behaviour of structures.
2. To familiarize the student with stability of plates under combined loads.

COURSE OUTCOMES:
Students will be able to
1. Analyze structures with linear and nonlinear behaviour.
2. Gain the knowledge on Stability of Continuous systems.
3. Distinguish elastic buckling and in elastic buckling.

SYLLABUS

UNIT-I

UNIT-II

UNIT-III
UNIT-IV
Torsional Buckling: Pure torsion of thin walled bars of open cross section – Non uniform torsion of thin walled bars of open cross section - Torsional buckling – Buckling of Torsion and Flexure.

UNIT-V
Lateral Buckling of simply supported Beams: Beams of rectangular cross section subjected for pure bending, Buckling of I Section subjected to pure bending.

TEXT BOOKS:

REFERENCE BOOKS:
RELIABILITY ANALYSIS AND DESIGN  
(ELECTIVE–III)

Lecture : 3 Periods  
Tutorial : 1 Period.  
Exam : 3 Hrs.  

Int.Marks : 30  
Ext. Marks : 70  
Credits : 3

COURSE OBJECTIVES:

1. To learn the importance of reliability in Civil engineering and concepts of computing structural reliability.

COURSE OUTCOMES:

Students will be able to
1. Understand the importance of reliability in Civil engineering.
2. Apply the concepts of computation of structural reliability for solving engineering problems.
3. Gain the knowledge of reliability based structural design.

SYLLABUS

UNIT-I


UNIT-II


UNIT-III


UNIT-IV

Level 2 Reliability Methods: Introduction, Basic variables and failure surface, First-order second-moment methods (FOSM).
UNIT-V

Reliability Based Design: Introduction, Determination of partial safety factors, Safety checking formats, Development of reliability based design criteria, Optimal safety factors, Summary of results of study for Indian standard – RCC design. Reliability of Structural Systems: Preliminary concepts as applied to simple structures.

TEXT BOOK:


REFERENCE BOOK:

1. “Structural Reliability” by Melchers, R.E., Wiley publications.
PRESTRESSED CONCRETE  
(ELECTIVE–III)

Lecture : 3 Periods  
Tutorial : 1 Period.  
Exam : 3 Hrs.  

Int.Marks : 30  
Ext. Marks : 70  
Credits : 3

COURSE OBJECTIVES:
1. To impart the knowledge on pre-stressing techniques and materials required for pre-stressing.
2. To familiarize the student with the losses of pre-stress and design of beams and slabs.

COURSE OUTCOMES:
Students will be able to
1. Analyze and design pre-stressed concrete members.
2. Gain the knowledge on materials, prestressing systems, end anchorages.
3. Gain the knowledge on losses of pre-stress.
4. Analyze and design of sections for flexure.

SYLLABUS

UNIT-I
General principles of Pre-stressing- Pre-tensioning and Post tensioning - Pre tensioning and Post tensioning methods- Different systems of Pre-stressing- Analysis of prestress and Bending stresses– Resultant– stress at a section – pressure line – concept of load balancing – stresses in tendons.

UNIT-II
Losses of Pre-stressing- Loss of Pre-stress in pre-tensioned and post tensioned members due to various causes - Elastic shortening of concrete, shrinkage of concrete, creep of concrete, relaxation of steel, slip in anchorage, differential shrinkage- bending of members and frictional losses- Long term losses

UNIT-III
Flexural, shear; torsional resistance and design of Prestressed concrete section. Types of flexural failure – code procedures-shear and principal stresses – Prestressed concrete members in torsion – Design of sections for flexure, Axial Tension, Compression and bending, shear, Bond

UNIT-IV
Analysis of continuous beams – Elastic theory- Linear transformation and Concordant tendons- Deflections of pre-stressed concrete beams: Importance of control of deflections- factors influencing deflections-short term deflections of un-cracked member – prediction of long term deflections
UNIT-V
Analysis of end blocks: By Guyon’s method and Magnel’s method, Anchorage zone stresses-
Approximate method of design- anchorage zone reinforcement- transfer of pre stresses- pre
tensioned members-Composite sections: Introduction-Analysis for stresses- differential
shrinkage- general design considerations

TEXT BOOKS:

1. Prestressed Concrete by N.KrishnaRaju, TataMcGrawhill, NewDelhi
2. Design of Prestressed Concrete Structures by T.Y. Lin and Ned. H. Burns, JohnWilley&
sons.

REFERENCE BOOKS:

1. Prestressed Concrete by N.Rajagopalan, Alpha Science publications.
2. Prestressed Concrete by P. Dayaratnam, Delhi publications.
COURSE OBJECTIVES:
1. To familiarize the student on various methods of optimization and design of structural members.

COURSE OUTCOMES:
Students will be able to
1. Derive optimized structure using classical and modern methods of optimization.
2. Gain the knowledge on Formulation of Structural Optimization problems.
3. Gain the knowledge on the concept of classical methods of optimization for multivariable
4. With equality or inequality constraints: solution by method of Lagrange Multiplier – Applications in structural engineering, Kuhn-Tucker conditions.

SYLLABUS

UNIT-I
Introduction: Need and scope for optimization – statements of optimization problems-Objective function and its surface design variables- constraints and constraint surface-Classification of optimization problems (various functions continuous, discontinuous and discrete) and function behavior (monotonic and unimodal)

UNIT-II
Classical optimization techniques: Differential calculus method, multi variable optimization by method of constrained variation and Lagrange multipliers (generalized problem) Khun-Tucker conditions of optimality -Fully stressed design and optimality criterion based algorithms-introduction, characteristics of fully stressed design theoretical basis-examples

UNIT-III
Non-Liner programming: Unconstrained minimization- Fibonacci, golden search, Quadratic and cubic interpolation methods for a one dimensional minimization and univariate method, Powel’s method, Newton’s method and Davidon Fletcher Powell’s method for multivariable optimization- Constrained minimization- Cutting plane method- Zoutendjik’s method- penalty function methods
UNIT-IV
Linear programming: Definitions and theorems- Simplex method-Duality in Linear programming- Plastic analysis and Minimum weight design and rigid frame

UNIT-V
Introduction to quadratic programming: Geometric programming- and dynamic programming- Design of beams and frames using dynamic programming technique

TEXT BOOKS:
3. Optimization Concepts and Application in Engineering- Belegundu A.D. and Chandrupatla

REFERENCE BOOKS:
INDUSTRIAL STRUCTURES
(ELECTIVE–IV)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int. Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVE:
1. This subject imparts a broad knowledge in the area of industrial structures.

COURSE OUTCOMES:
Upon completion of this course, the student will be able to
1. Know the requirements of various industries.
2. Design the roofs and Gantry girder for Industrial buildings.
3. Design the Folded plates and Bunkers and silos.
4. Design the Chimneys, cooling towers and Transmission of towers.

SYLLABUS

UNIT-I
Planning and functional requirements- classification of industries and industrial structures-
planning for layout- requirements regarding lighting ventilation and fire safety- protection
against noise and vibrations

UNIT-II
Industrial buildings- roofs for industrial buildings (Steel) - design of gantry girder-

UNIT-III
Design of Folded plates- Design considerations- analysis of folded plates- analysis of multibay
folded plates- design of diaphragm beam

UNIT-IV
Power plant structures- Bunkers and silos- chimney and cooling towers-Nuclear containment
structures.
Power transmission structures- transmission line towers- tower foundations- testing tower
UNIT-V
Light gauge steel structures: Local buckling of thin sections, Post packing of thin elements, Light gauge steel columns and compression members, Form factor for columns and compression members, Stiffened compression elements, Multiple stiffened compression elements, Unstiffened compression elements effective length of light gauge steel compression members, Basic design stress, Allowable design stress, Light gauge steel beams, Laterally supported light gauge steel beams web crippling. Allowable design stress in beams, Beams subjected to combined axial and bending stress, connections.

TEXT BOOKS:
2. Design of Steel Structures by Duggal S.K, Tata McGrawHill Education2000

REFERENCE BOOKS:
1. Advanced reinforced concrete design- N. KrishnamRaju
2. Handbook on machine foundations- P. Srinivasulu and C.V. Vaidyanathan
3. Tall Chimneys- Design and construction – S.N. Manohar
5. SP 32: 1986, Handbook on functional requirements of Industrial buildings
6. Design of shells- K. Chandrasekhar
BRIDGE ENGINEERING
(ELECTIVE-IV)

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**COURSE OBJECTIVES:**
1. To learn relevant code of practice for the design of steel Bridges.
2. To analyze and design of Plate girder Bridges.

**COURSE OUTCOMES:**
After completion of course students should be able to
1. Apply the IS code of practice for the design of steel bridges.
2. Analyze and design of Plate girder Bridges.

**SYLLABUS**

**UNIT-I**
Masonry arch Bridge design details- Rise, radius, and thickness of arch- Arch ring-Dimensioning of sub structures- Abutments pier and end connections.(Ref: IRC- SP-13)

**UNIT-II**

**UNIT-III**
Plate girder bridges- Elements of plate girder and their design-web-flange- intermediate stiffener-vertical stiffeners- bearing stiffener-design problem

**UNIT-IV**
Prestressed Concrete and Composite bridges- Preliminary dimensions-flexural and torsional parameters- Courbon’s Theory – Distribution coefficients by exact analysis- design of girder section- maximum and minimum prestressing forces- eccentricity- live load and dead load shear forces- cable zone in girder-check for stresses at various sections- check for diagonal tension- diaphragms and end block design- short term and long term deflections- Composite action of composite bridges- shear connectors-composite or transformed section- design problem. (Ref: IRC: Section-VI)
UNIT-V
Sub structure- Abutments- Stability analysis of abutments- piers- loads on piers – Analysis of piers- Design problem(Ref: IRC-13, IRC-21, IRC-78)- Pipe culvert- Flow pattern in pipe culvers- culvert
alignment-culvert entrance structure- Hydraulic design and structural design of pipe culverts- reinforcements in pipes .(Ref: IRC: SP-13)

TEXT BOOKS:

1. Design of Steel structures by N. Subramanian, Oxford University Press.
2. Design of concrete bridges- Aswini, Vazirani, Ratwani
3. Essentials of bridge engineering- Jhonson Victor D

REFERENCE BOOKS:

1. Comprehensive design of steel structures-B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications (P) Ltd.
2. Design of Steel Structures by Duggal S.K, Tata McGrawHill Education2000
EARTH RETAINING STRUCTURES
(ELECTIVE–IV)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:
1. To impart the knowledge on different types of earth pressure theories and know to design different types of Retaining walls.
2. To impart the knowledge on different types of sheet pile structures and Reinforced earth structures.

COURSE OUTCOMES:
After completion of course students should be able to
1. Design the different types of Retaining walls and sheet piles using earth pressure theories.
2. Design the reinforced earth structures, Braced cuts and cofferdams.

SYLLABUS

UNIT-I
Earth pressures – Different types and their coefficients- Classical Theories of Earth pressure – Rankine’s and Coulomb’s Theories for Active and Passive earth pressure- Computation of Lateral Earth Pressure in Homogeneous and Layered soils- Graphical solutions for Coulomb’s Theory in active and passive conditions.

UNIT-II

UNIT-III

UNIT-IV
UNIT-V

TEXT BOOKS
1. Principles of Foundation Engineering by Braja M. Das.

REFERENCE BOOKS
COMPUTER APPLICATIONS IN STRUCTURAL ENGINEERING LAB

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COURSE OBJECTIVES:

1. To apply the civil engineering software to some of the structural engineering problems.

COURSE OUTCOMES:

Students will be able to

1. Analyze the structural elements using software designs.
2. Design the structures for the dynamic loads using software’s.
3. Solve the finite elements application problems of structural engineering by software’s.

SYLLABUS

Analysis and Design using STADD, STRAP, STRUDS, ANSYS

1. Programming for beams subject to different loading (mandatory).
2. Analysis of reinforced concrete multistoried building
3. Analysis of steel transmission line tower
4. Analysis of plane and space truss
5. Analysis of plane and space frame
6. Determination of mode shapes and frequencies of tall buildings using lumped mass (stick model) approximation
7. Wind analysis on tall structure
8. Analysis of pre stressed concrete bridge girder
9. Analysis of Cylindrical shell
10. Modal Analysis of a Cantilever Beam

NOTE: A minimum of eight (including item 1) from the above set have to be conducted.

REFERENCE BOOKS:

1. Computer aided design laboratory (Civil Engineering) by SheshaPrakash and Suresh.S
2. Computer Applications In Structural Engineering by David R.Jenkins, American Society of Civil Engineers
SCHEME OF INSTRUCTION & EXAMINATION
(Regulation R17)

M.TECH (STRUCTURAL ENGINEERING)
DEPARTMENT OF CIVIL ENGINEERING

(With effect from 2017-2018 Admitted Batch onwards)
Under Choice Based Credit System

III-SEMESTER

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1. The Viva-Voce for the Comprehensive Viva-Voce and Seminar-I shall be held with the Project Guide, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.

2. Candidates can do their Project Work Part-I&II work within the department or in any industry/research organization for two semesters (i.e. 3rd and 4th semesters). In case of thesis done in an industry/research organization, one advisor (Guide) should be from the department and one advisor (Co-Guide) should be from the industry/research organization.

3. The Project Work Part-I should be submitted at the end of 3rd Semester and it will be evaluated through Review by a committee consisting of Head of the Department, PG coordinator and Project guide. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.
SCHEME OF INSTRUCTION & EXAMINATION
(Regulation R17)

M.TECH (STRUCTURAL ENGINEERING)
DEPARTMENT OF CIVIL ENGINEERING

(With effect from 2017-2018 Admitted Batch onwards)
Under Choice Based Credit System

IV-SEMESTER

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1. The viva-voce for Seminar-II shall be held with the Project Guide, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.

2. A publication of a paper on the thesis work in a National/International Journal at the end of 4th semester is mandatory for the submission of thesis work.

3. The Project Work Part-II should be submitted at the end of 4th semester and it will be evaluated through Viva–Voce examination by a committee consisting of External Examiner, Head of the Department, Project guide and PG coordinator. The marks shall be awarded in the ratio of 40, 20, 20 and 20 Marks by the members respectively.
SCHEME OF INSTRUCTION & EXAMINATION
(Regulation R17)

M.TECH. (COMPUTER SCIENCE & TECHNOLOGY)
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
(With effect from 2017-2018 Admitted Batch onwards)
Under Choice Based Credit System

I-SEMESTER

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* - Audit Course
ADVANCED DATA STRUCTURES AND ALGORITHM ANALYSIS

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COURSE OBJECTIVES:

1. Student will learn about advanced data structures
2. Practice the algorithms for manipulating advanced data structures, and how to analyze the time and memory requirements of them.
3. Student will master some complex searching and sorting algorithms and their data structures, advanced types of trees, basic computational geometry procedures, and graph representations and graph algorithms.
4. Student will learn when and how to use techniques for developing algorithms, such as divide-and-conquer and dynamic programming.
5. Student will also become skilled in algorithmic analysis and algorithm development using the latest techniques.

COURSE OUTCOMES:

1. Could be able to write programs and class libraries given a specification.
2. Implement various data structures.
3. Implement and analyze various sorting algorithms.
4. Understand abstract data types.
5. Know how they are implemented in C++ programming language.

SYLLABUS

UNIT- I:

UNIT-II:

UNIT- III:
Dictionaries, ADT, The List ADT, Stack ADT, Queue ADT, Hash Table Representation, Hash Functions, Collision Resolution-Separate Chaining, Open Addressing-Linear Probing, Double Hashing.
UNIT - IV:

UNIT –V:

TEXT BOOKS:
1. Data Structure, A Pseudocode Approach, 2/e, Richard F. Gilberg, Behrouz A. Forouzon, Cengage
2. Data Structures, Algorithms and Applications in java, 2/e, Sartaj Sahni, University Press
3. Data Structures And Algorithm Analysis, 2/e, Mark Allen Weiss, Pearson.

REFERENCES BOOKS:
1. Data Structures And Algorithms, 3/e, Adam Drozdek, Cengage.
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

COURSE OBJECTIVES:
1. To explain with examples the basic terminology of functions, relations and sets.
2. To perform the operations associated with functions, relations and sets.
3. To relate practical examples appropriate to the set, function, relation or relation model and interpret the associated operations and terminology.
4. To describe the importance and limitations of predicate logic.
5. To relate ideas of mathematical induction to recursion and recursively defined structures.

COURSE OUTCOMES:
1. Critical, logical-mathematical reasoning
2. Ability to apply mathematical knowledge and logic in solving problems.
3. Students develops the ability to illustrate basic terminology of functions, relations and demonstrate knowledge of their associated operations.
4. Able to demonstrate practical applications and use of basic counting principles of permutations and combinations.
5. Able to represent and apply theory in solving computer science applications

SYLLABUS

UNIT- I:
Predicate calculus: Predicates, statement functions, variables and quantifiers, predicate formulas, free & bound variables, universe of discourse, inference theory of predicate calculus

UNIT- II:

UNIT- III:
UNIT- IV:

UNIT- V:
Graph Theory: Representation of Graph, Spanning Trees, BFS, DFS, Kruskals Algorithm, Binary trees, Planar Graphs, Graph Theory and Applications, Basic Concepts, Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers

TEXT BOOKS:
1. Discrete Mathematical Structures with Applications to computer science, J.PTremblery, R.Manohar,TMH.

REFERENCE BOOKS:
1. Elements of Discrete Mathematics, C L Liu, D P Mohanpatra,TMH
2. Discrete Mathematics, Schaum’s Outlines, Lipschutz, LipsonTMH.
COURSE OBJECTIVES:
1. To have a thorough understanding of the basic structure operation of Digital Computer.
2. To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point addition, Subtraction, multiplication & division.
3. To study the different ways of communicating with I/O devices and standard I/O interfaces.
4. To study the hierarchical memory system including cache and Virtual memory

Course Outcomes:
1. Apply the basic knowledge about Different Number Systems, Digital logic to the Functional components of computer. [K 3]
2. Students will be able to Describe the major components of a computer. [K 2]
3. Students will be able to classify different Computer Instructions. [K 2]
4. Students will be able to Describe Instruction set architecture. [K 2]
5. Recognize the importance of peripheral devices. [K 2]
6. Students should be able to classify Computer memories [K 2]

SYLLABUS

UNIT – I

UNIT – II
Combinational and Sequential Circuits, Decoders, Encoders, Multiplexers, Half and Full adders, Shift Registers, Flip-Flops, Binary Counters, Memory Unit.

UNIT -III
Memory Organization, Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory Virtual Memory concept.

UNIT – IV
Arithmetic and Logic Unit Design, Addition and Subtraction, Sign and Unsigned Numbers, Multiplication and Division algorithms, BCD adders.

UNIT – V
TEXT BOOKS:
2. Micro Processor and Interfacing, 2/e, Douglas V, TMH.

REFERENCE BOOKS:
1. Digital Logic and Computer Organisation, Rajaraman, Radha Krishnan, PHI.
2. Micro Computer Systems: 8086/8088 family, 2/e, Liu, Gibson, PHI.
DATABASE MANAGEMENT SYSTEMS

Lecture : 3 Periods  Int.Marks : 30
Tutorial : 1 Period.  Ext. Marks : 70
Exam : 3 Hrs.  Credits : 3

COURSE OBJECTIVES:
1. Discovering the relational model and formal query languages
2. Preparing SQL commands for definition, constructing and manipulation of databases
3. Applying conceptual and logical database design
4. Applying normalization on tables
5. Scheduling concurrent transactions using locking protocols and protocols without locking
6. Discussing transaction recovery techniques.
7. Exploring the various indexing techniques

COURSE OUTCOMES:
On successful completion of the course a student will able
1. To construct SQL commands for creating database objects, populating tables, and retrieve data
2. To prepare queries in formal query languages
3. To explore the features of RDBMS
4. To apply conceptual database design
5. To apply logical database design
6. To normalize the tables.
7. To know different protocols of Concurrency control
8. To apply Recovery techniques of DBMS
9. To understand different indexing techniques

SYLLABUS

UNIT- I:

UNIT- II:
UNIT- III :

UNIT- IV:
Overview of Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions – Lock Based Concurrency Control, Deadlocks – Performance of Locking – Transaction Support in SQL. Concurrency Control: Serializability, and recoverability – Introduction to Lock Management – Lock Conversions, Dealing with Dead Locks, Specialized Locking Techniques – Concurrency Control without Locking. Crash recovery: Introduction to Crash recovery, Introduction to ARIES, the Log , Other Recovery related Structures, the Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media recovery

UNIT-V:

TEXT BOOKS:

REFERENCE BOOKS:
1. Database Management System Oracle SQL and PL/SQL,P.K.Das Gupta,PHI.
ADVANCED OPERATING SYSTEMS

Lecture: 3 Periods
Tutorial: 1 Period
Exam: 3 Hrs.

Int. Marks: 30
Ext. Marks: 70
Credits: 3

COURSE OBJECTIVES:
1. To explain the concepts of distributed systems
2. To know network protocols and RPC
3. To explain the concepts of shared memory in Distributed systems
4. To understand Process, Processors a and Synchronization in Distributed systems
5. To explain File and Directory Services in Distributed systems

COURSE OUTCOMES:
On successful completion of the course a student will able
1. To understands the concept of Distributed systems
2. To understand the concepts of shared memory and process synchronization
3. To handle deadlocks in distributed systems
4. To understand failures and Recovery in distributed systems
5. To understand File and directory structure in Distrubutes operating systems

SYLLABUS

UNIT - I:

UNIT - II:
Distributed Deadlock Detection -Introduction - deadlock handling strategies in distributed systems - issues in deadlock detection and resolution - control organizations for distributed deadlock detection - centralized and distributed deadlock detection algorithms -hierarchical deadlock detection algorithms. Agreement protocols - introduction-the system model, a classification of agreement problems, solutions to the Byzantine agreement problem, applications of agreement algorithms. Distributed resource management: introduction-architecture - mechanism for building distributed file systems - design issues - log structured file systems.

UNIT - III:
UNIT - IV:
Protection and security - preliminaries, the access matrix model and its implementations. - safety in matrix model- advanced models of protection. Data security - cryptography: Model of cryptography, conventional cryptography- modern cryptography, private key cryptography, data encryption standard- public key cryptography - multiple encryption - authentication in distributed systems.

UNIT - V:
Multiprocessor operating systems - basic multiprocessor system architectures - inter connection networks for multiprocessor systems - caching - hypercube architecture. Multiprocessor Operating System - structures of multiprocessor operating system, operating system design issues- threads- process synchronization and scheduling. Database Operating systems :Introduction- requirements of a database operating system Concurrency control : theoretical aspects - introduction, database systems - a concurrency control model of database systems- the problem of concurrency control - serializability theory- distributed database systems, concurrency control algorithms - introduction, basic synchronization primitives, lock based algorithms-timestamp based algorithms, optimistic algorithms - concurrency control algorithms, data replication.

TEXT BOOKS:
1. MukeshSinghal, Niranjan G. Shivaratri, "Advanced concepts in operating systems: Distributed, Database and multiprocessor operating systems", TMH, 2001

REFERENCE BOOKS:
1. Andrew S. Tanenbaum, "Modern operating system", PHI, 2003
3. Andrew S. Tanenbaum, "Distributed operating system", Pearson education, 2003
DATA WAREHOUSING AND DATA MINING

<table>
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<td>1 Period</td>
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<tr>
<td>Exam</td>
<td>3 Hrs.</td>
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**COURSE OBJECTIVES:**

1. To differentiate Online Transaction Processing and Online Analytical processing
2. Learn Multidimensional schemas suitable for data warehousing
3. Understand various data mining functionalities
4. To inculcate knowledge on data mining query languages.
5. To know in detail about data mining algorithms
6. The objective of this course is to study various techniques involved in data mining, data warehousing.

**COURSE OUTCOMES:**

1. Extract knowledge using data mining techniques
2. At the closing stage of the course, students will be able to analyse different operations and techniques involved in data mining.
3. Evaluate Classification algorithms.
4. Evaluate Clustering algorithms.
5. Describe Multidimensional data model and data mining primitive.

**SYLLABUS**

**UNIT I: DATA WAREHOUSING:**

**UNIT II: BUSINESS ANALYSIS:**

**UNIT III: DATA MINING:**

**UNIT IV: ASSOCIATION RULE MINING AND CLASSIFICATION:**
Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction – Basic Concepts – Decision Tree Induction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction.
UNIT V : CLUSTERING AND TRENDS IN DATA MINING:

TEXT BOOKS:

REFERENCE BOOKS:
1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction to Data Mining”, Person Education, 2007
COURSE OBJECTIVES:
1. To introduce the graduate, simple linear & non-linear data structures.
2. To make the student write ADTs, for all data structures
3. To make the student learn different algorithm design techniques.
4. To understand the design aspects of operating system.
5. To study the process management concepts & Techniques.
6. To study the storage management concepts.

COURSE OUTCOMES: At the end of this course student able to
1. Implement Linear data structures
2. Non-linear data structures
3. Sorting techniques Design of various projections
4. Use of an operating system to develop software
5. Write software systems based on multiple cooperating processes or threads
6. Implement file organization techniques
7. Implement file allocation strategies
8. Implement process scheduling & synchronization algorithms
9. Implement memory management scheme like best fit, worse fit etc.

SYLLABUS

Data Structures Programs:
1. To implement Stacks & Queues using Arrays & Linked Lists
2. To implement Stack ADT, Queue ADT using arrays & Linked Lists
3. To implement Dequeue using Double Linked List & Arrays
4. To perform various Recursive & Non-recursive operations on Binary Search Tree
5. To implement BFS & DFS for a graph
6. To implement Merge & Heap sort of given elements
7. To perform various operations on AVL trees
8. To implement Krushkal’s algorithm to generate a min-cost spanning tree
9. To implement Prim’s algorithm to generate min-cost spanning tree.
10. To implement functions of Dictionary using Hashing

Operating system programs:
1. Program to implement FCFS(First Come First Serve)scheduling Algorithms
2. Program to implement SJF(Shortest Job First)Scheduling Algorithm
3. Program to implement Priority Scheduling algorithm
4. Program to implement Round Robin Scheduling algorithm
5. Program to implement FIFO(First In First Out) Page Replacement Algorithm
6. Program to implement LRU(least Recently used) Page Replacement Algorithm
7. Program to implement LFU(Least Frequently used) Page Replacement Algorithm
8. Write a program to implement how Disk Scheduling is done in operating system
9. Draw the appropriate C.P.U performance graphs for SJF Scheduling Algorithm
REFERENCE BOOKS:

COURSE OBJECTIVES:
1. To practice data definition, data manipulation and data control commands of SQL
2. To create procedures, functions using PL/SQL
3. Study features of two commercial DBMS
4. Create forms and reports
5. To design a mini-project
6. To implement a mini-project covering all the commands learnt

COURSE OUTCOMES:
At the end of this course student will be able to
1. To create tables and views.
2. To execute SQL queries.
3. To modify the data and structure of tables and views.
4. To apply triggers for data modification events
5. To create procedures and functions using PL/SQL.
6. To design a database mini-project.
7. To implement a min-project

SYLLABUS

List of Experiments:
1. SQL commands (DDL, DML and DCL)
2. Functions and Procedures
3. Triggers, views and sequences
4. Practiceto create Forms
5. Practice to create Reports
6. Implement a Mini Project
   A. Write problem statement
   B. Draw ER diagrams
   C. Convert to Tables
   D. Normalization
   E. Insert appropriate data
   F. Security design
   G. Forms
   H. Reports

REFERENCE BOOKS:
SCHEME OF INSTRUCTION & EXAMINATION  
(Regulation R17)  
M.TECH. (COMPUTER SCIENCE & TECHNOLOGY)  
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING  
(With effect from **2017-2018** Admitted Batch onwards)  
Under Choice Based Credit System  

II-SEMESTER

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*Audit Course
CYBER SECURITY

Code: M17 CST 1201

Lecture: 3 Periods  Int. Marks: 30
Tutorial: 1 Period.  Ext. Marks: 70
Exam: 3 Hrs.  Credits: 3

COURSE OBJECTIVES:
1. Comprehend the history of computer security and how it evolved into information security.
2. Understand the threats posed to information security and the more common attacks associated with those threats.
3. Understand the concept of developing encryption and decryption algorithms.
4. Understand the various techniques of encryption, key management in security and its importance.
5. Understand the threats present in computer networks and counter measures for the same.
6. Understand the Need of Web security and Intrusion Detection Systems.

COURSE OUTCOMES:
1. Able to understand the basic concepts and goals of Information security.
2. Able to examine different classical cryptosystems.
3. Able to understand the ideas of public key cryptosystems and digital signature schemes.
4. Able to examine different network security protocols.
5. Able to understand access control and authentication mechanisms.
6. Able to understand appropriate procedures required to secure networks.

SYLLABUS

UNIT I:
Introduction:
Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

UNIT II:
Conventional Encryption:
Conventional Encryption Principles, Conventional encryption algorithms, cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC

UNIT III:
Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat’s and Euler’s Theorems, The Chinese Remainder theorem, Discrete logarithms
Public key: Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service
UNIT IV:
**Transport Level Security**: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET)
**Email Privacy**: Pretty Good Privacy (PGP) and S/MIME.

UNIT V:
**Intrusion Detection**: Intruders, Intrusion Detection systems, Password Management.
**Malicious Software**: Viruses and related threats & Countermeasures.
**Firewalls**: Firewall Design principles, Trusted Systems.

TEXT BOOKS:

REFERENCE BOOKS:
COURSE OBJECTIVES:

1. Build an understanding of the fundamental concepts of computer networks.
2. Familiarize the student with various Computer Network protocols.
3. To make the student to implement various Network Layers.
4. Allow the student to gain expertise in some specific areas of networks such as the design and maintenance of individual Computer Networks.

COURSE OUTCOMES:

After completing this course the student able to demonstrate the knowledge and ability to:

1. Independently understand basic computer network technology.
2. Identify the different types of network topologies and protocols.
3. Explain various transmission media and implement various multiplexing techniques.
4. Implement various Link layer protocols like flow control and error control.
5. Implement various medium access control mechanisms and protocols.
6. Understand Wireless LAN protocols and architectures.
7. Implement Network layer design issues like switching mechanisms, routing and traffic management.

SYLLABUS

UNIT – I

UNIT – II

UNIT – III
UNIT – IV

UNIT – V

TEXT BOOKS:

REFERENCE BOOKS:
BIGDATA ANALYTICS

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:

1. To provide advanced knowledge and skills in the fields of Computer science and engineering.
2. To introduce java concepts related to data structures and map reduce programs
3. To impart the architectural concepts and configuration of Hadoop
4. Introducing map reduce paradigm
5. To introduce programming platforms like PIG and HIVE in Hadoop echo system.

COURSE OUTCOMES:

At the end of the course the student will be able to
1. Implement data structures and map reduce paradigm using java
2. Configure Hadoop distributed file system
3. Understand Hadoop I/O
4. Write scripts using PIG and run them in local and distributed modes
5. Apply structure to Hadoop data with HIVE

SYLLABUS

UNIT-I
Data structures in Java: Linked List, Stacks, Queues, Sets, Maps; Generics: Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization

UNIT-II

UNIT-III
Writing MapReduce Programs: A Weather Dataset, Understanding Hadoop API for MapReduce Framework (Old and New), Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, Record Reader, Combiner, Partitioner

UNIT-IV
Hadoop I/O: The Writable Interface, Writable Comparable and comparators, Writable Classes: Writable wrappers for Java primitives, Text, Bytes Writable, Null Writable, Object Writable and Generic Writable, Writable collections, implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom comparators
UNIT-V
Pig: Hadoop Programming Made Easier:
Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the
ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out
the Pig Script Interfaces, Scripting with Pig Latin
Applying Structure to Hadoop Data with Hive:
Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive,
Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and
Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data

TEXT BOOKS:

3. Hadoop in Action by Chuck Lam, MANNING Publ.
4. Hadoop for Dummies by Dirk deRoos, Paul C. Zikopoulos, Roman B. Melnyk, Bruce Brown, Rafael Coss

REFERENCE BOOKS:

1. Hadoop in Practice by Alex Holmes, MANNING Publications.
2. Hadoop MapReduce Cookbook, Srinath Perera, Thilina Gunarathne

SOFTWARE LINKS:

2. Hive: https://cwiki.apache.org/confluence/display/Hive/Home
MACHINE LEARNING

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<td>Exam</td>
<td>3 Hrs.</td>
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Int. Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:

The main objective of this course is for the students

1. To achieve basic knowledge of artificial intelligence
2. A deepened technical understanding of machine learning research and theories
3. To give experience of the use and design of machine learning and data mining algorithms for applications
4. To critically review and compare different algorithms and methods.
5. To plan, design, and implement learning components and applications.

COURSE OUTCOMES:

1. The student will be able understand the two main areas of Machine Learning i.e. Supervised and unsupervised learning.
2. To understand main models and algorithms for Regression, Classification particularly beyond binary classification.
3. To understand variety of learning algorithms.
4. To evaluate and compare the performance of learning algorithms.
5. To understand support vector machine.

SYLLABUS

UNIT -I: The ingredients of machine learning, Tasks: the problems that can be solved with machine learning, Models: the output of machine learning, Features, the workhorses of machine learning. Binary classification and related tasks: Classification, Scoring and ranking, Class probability estimation

UNIT- II: Beyond binary classification: Handling more than two classes, Regression, Unsupervised and descriptive learning. Concept learning: The hypothesis space, Paths through the hypothesis space, Beyond conjunctive concepts

UNIT- III: Tree models: Decision trees, Ranking and probability estimation trees, Tree learning as variance reduction. Rule models: Learning ordered rule lists, Learning unordered rule sets, Descriptive rule learning, First-order rule learning

UNIT- V: Probabilistic models: The normal distribution and its geometric interpretations, Probabilistic models for categorical data, Discriminative learning by optimizing conditional likelihood Probabilistic models with hidden variables. **Features:** Kinds of feature, Feature transformations, Feature construction and selection. Model ensembles: Bagging and random forests, Boosting

**TEXT BOOKS:**

2. Machine Learning, Tom M. Mitchell, MGH.

**REFERENCE BOOKS:**

1. Understanding Machine Learning: From Theory to Algorithms, Shai Shalev-Shwartz, Shai Ben-David, Cambridge.
SOFTWARE ENGINEERING
(ELECTIVE-I)

Lecture : 3 Periods  Int.Marks : 30
Tutorial : 1 Period. Ext. Marks : 70
Exam : 3 Hrs. Credits : 3

COURSE OBJECTIVES:
1. The students had strong knowledge in Software Systems and about various process models.
2. The students can able to build systems by following well defined Software Engineering Principles.
3. The students can able to distinguish between Structured Design approach and Object Oriented design approach.
4. The students can build quality software systems by implementing effective Testing phase.
5. To utilise various Computer Aided Software Engineering Tools.

COURSE OUTCOMES:
At the end of the course the student could able to
1. Understand the nature of software and various software process models.
2. Gather, analyse and Specify Software Requirements for any system.
3. Design various aspects of the system like System design, Database design, User Interface design etc., by following Structural Design of Object Oriented Design
4. Apply various Software testing techniques to increase the reliability of the system
5. Understand various Software Quality Management Techniques

SYLLABUS

UNIT-I:

UNIT-II:

UNIT – III:
User Interface Design: Characteristics of Good User Interface, Basic Concepts, Types of User Interfaces, Fundamentals of Component-based GUI Development, A User Interface Design Methodology.
UNIT – IV:

UNIT – V:
**Software Reliability And Quality Management:** Software Reliability, Statistical Testing, Software Quality, Software Quality Management System, ISO 9000, SEI Capability Maturity Model.
**Computer Aided Software Engineering:** Case and its Scope, Case Environment, Case Support in Software Life Cycle, Other Characteristics of Case Tools, Towards Second Generation CASE Tool, Architecture of a Case Environment

**TEXT BOOKS:**

**REFERENCE BOOKS:**
ARTIFICIAL INTELLIGENCE
(ELECTIVE-I)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:
1. To introduce different artificial intelligence techniques
2. To learn characteristics of AI problems
3. Learn recent algorithms in artificial intelligence
4. To introduce expert systems in AI
5. To describe advanced knowledge representation in AI

COURSE OUTCOMES:
1. Able to learn artificial intelligence techniques
2. Understand the concept of knowledge representation
3. Able to apply logic concepts to ascertain facts
4. Able to apply heuristic search methods in reaching the goal
5. Able to solve problems using advanced knowledge representation methods.
6. Able to understand expert systems

SYLLABUS

UNIT-I:
Introduction to artificial intelligence: Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of ai languages, current trends in AI

UNIT-II:
Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative-deepening a*, constraint satisfaction
Problem reduction and game playing: Introduction, problem reduction, game playing, alpha-beta pruning, two-player perfect information games

UNIT-III:
Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic

UNIT-IV:
UNIT-V:

**Expert system and applications:** Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools

**TEXT BOOKS:**

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning,
2. Artificial intelligence, A modern Approach, 2nd ed, Stuart Russel, Peter Norvig, PEA
3. Artificial Intelligence- Rich, Kevin Knight, Shiv Shankar B Nair, 3rd ed, TMH
4. Introduction to Artificial Intelligence, Patterson, PHI

**REFERENCE BOOKS:**

1. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5th ed, PEA
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer
COMPUTER DESIGN
(ELECTIVE-I)

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COURSE OBJECTIVES:
1. To learn the various system software like assemblers, loaders, linkers and macro.
2. To study the features of design phases and parsing techniques of a Compiler.
3. To learn the various techniques of syntax directed translation & code optimization.
4. To introduce the major concept areas of language translation and compiler design.
5. To enrich the knowledge in various phases of compiler ant its use, code optimization techniques, machine code generation, and use of symbol table.
6. To extend the knowledge of parser by parsing LL parser and LR parser.

COURSE OUTCOMES:
1. To acquire the knowledge of modern compiler & its features
2. To use the knowledge of patterns, tokens & regular expressions
3. To learn the new code optimization techniques to improve the performance of a program in terms of speed & space
4. Able to design and implement parsers
5. Able to compile simple C programs using their own designed compiler

SYLLABUS

UNIT – I
Introduction Language Processing, Structure of a compiler the evaluation of Programming language, The Science of building a Compiler application of Compiler Technology Programming Language Basics. Lexical Analysis:- The role of lexical analysis buffing, specification of tokens. Recognitions of tokens the lexical analyzer generator lexical

UNIT –II
Syntax Analysis: The Role of a parser, Context free Grammars Writing A grammar, top down parsing bottom up parsing, ,Shift Reduce parser, Operator Precedence Parser, Predictive Parser, Introduction to LR Parser.

UNIT –III
UNIT – IV
Intermediated Code: Generation Variants of Syntax trees 3 Address code Quadruples, Triples and Indirect Triples, Types and Deceleration, Translation of Expressions, Type Checking, code optimization, The principle sources of optimization, Loop Optimization, DAG, Global data flow analysis.

UNIT – V
Code Generation: A simple code generator, Register allocation and assignment, Code generation from DAG, Peep hole optimization, Symbol table, Activation Record, Runtime Environments, Stack allocation of space, access to Non Local date on the stack Heap Management code generation.

TEXT BOOKS:
2. Compiler Design K.Muneeswaran,OXFORD

REFERENCE BOOKS:
1. Compiler Construction, Principles and Practice, Kenneth C Louden, CENGAGE
2. Implementations of Compiler, A New approach to Compilers including the algebraic methods,Yunlinsu, SPRINGER
EMBEDDED SYSTEMS
(ELECTIVE-I)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:
1. To provide in-depth knowledge about Embedded Processor, its hardware and software.
2. To explain the programming concepts, Embedded programming in C & Assembly language.
3. To explain various architectures of Embedded Systems.
4. To explain Real Time Operating Systems.
5. To explain about Inter task communication.
6. To explain about Embedded software development tools.

COURSE OUTCOMES:
On successful completion of the course a student will able
1. To describe the differences between general computing system and Embedded System.
2. To recognize the classification of Embedded System.
3. To understand various architectures of Embedded System.
4. To design Real Time Embedded System using the concepts of RTOS.
5. To load embedded software on Host machine.
6. To test Host machine.

SYLLABUS

UNIT I:

UNIT II:

UNIT III:

UNIT IV:
UNIT V:

Host and Target Machines – Linker/Locator for Embedded Software- Getting Embedded Software into the Target System, Testing on your Host Machine – Instruction Set Simulators – Laboratory Tools used for Debugging.

TEXT BOOKS:

2. Sriram V Iyer and Pankaj Gupta, Embedded Real Time Systems programming, TMH, 2004

REFERENCE BOOKS:

IMAGE PROCESSING
(ELECTIVE-II)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:
1. Overview of digital image processing field
2. Understand the fundamental digital image processing algorithms and implementation
3. Gain experience in applying image processing algorithms to real problems.
4. Cover the basic theory and algorithms that are widely used in digital image processing.
5. Expose students to current technologies and issues that are specific to image processing systems

COURSE OUTCOMES:
1. Demonstrated understanding of the basic concepts of two-dimensional signal acquisition, sampling, and quantization.
2. Demonstrated understanding of spatial filtering techniques, including linear and nonlinear methods.
3. Demonstrated understanding of 2D Fourier transform concepts, including the 2D DFT and FFT
4. Uses of Fourier transform in frequency domain filtering.
5. Demonstrated understanding of the fundamental image enhancement algorithms such as histogram modification, contrast manipulation, and edge detection.

SYLLABUS

UNIT I:
Introduction: Digital Image representation, fundamentals steps in Digital Image Processing, Applications of Computer graphics and Image Processing, Fundamentals on Pixel concepts,

UNIT II:
Transformations: Translations, Scaling, rotation, reflection and shear transformations, Homogeneous coordinates, Composite Transformations- Reflection about an arbitrary line; Windowing and clipping, viewing transformations, Cohen- Sutherland clipping algorithm

UNIT III:
Color Images: Pixel brightness transformations, Local Preprocessing, image smoothing, Edge detectors, Robert Operators, Laplace, Prewitt, Sobel, Fri-chen, Canny Edge detection

UNIT IV:
Mathematical Morphology: Basic Mathematical Concepts, Binary dilation and Erosion, Opening and closing, Gray Scale dilation and erosion, Skeleton, Thinning, Thickening Ultimate erosion, Geodesic transformations, Morphology and reconstruction, Morphological Segmentation
UNIT V:
SEGMENTATION: Threshold detection methods, Optimal Thresholding, Edge based Segmentation-
Edge image thresholding, Edge relaxation, Border tracing, Hough Transforms, Region based
segmentation: Region Merging Region Splitting, Splitting and Merging, Watershed Segmentation.

Image Data Compression: Image data Properties, Discrete Image Transformations in data compression,
Discrete Cosine and Wavelet Transforms, Types of DWT and merits; Predicative Compression methods,
Hierarchical and Progressive Compression methods, Comparison of Compression methods, JPEG-
MPEG Image Compression methods.

TEXT BOOKS:

   Learning, 3ed, ( Unit III, Unit IV, Unit V and UnitVI)

REFERENCE BOOKS:

2. Digital Image Processing with MATLAB and LABVIEW, Vipul Singh, Elsevier
### Course Objectives:
1. To understand the scope, design and model of parallelism.
2. Know the parallel computing architecture.
3. Know the Characteristics, model and design of parallel algorithms.
5. Solve a complex problem with message passing model and programming with MPI.

### Course Outcomes:
Students who complete this course successfully are expected to
1. Recall fundamental concepts of parallelism
2. Design and analyze the parallel algorithms for real world problems
3. Implement parallel algorithms on available parallel computer systems.
4. Ability to analyse parallel algorithms for sorting and searching on different parallel architectures.
5. Try to utilize Multicore Architectures.

### Syllabus

#### Unit I: Introduction:
Computational demand in various application areas, advent of parallel processing, terminology-pipelining, Data parallelism and control parallelism-Amdahl’s law.

#### Unit II: Scheduling:

#### Unit III: Algorithms:
Elementary Parallel algorithms on SIMD and MIMD machines, Analysis of these algorithms. Matrix Multiplication algorithms on SIMD and MIMD models. Fast Fourier Transform algorithms. Implementation on Hyper cube architectures. Solving linear system of equations, parallelizing aspects of sequential methods back substitution and Tri diagonal.

#### Unit IV: Sorting:
UNIT V: Searching
Parallel algorithms for Graph searching, All Pairs shortest paths and minimum cost spanning tree. Parallelization aspects of combinatorial search algorithms with Focus on Branch and Bound Methods and Alpha-beta Search methods.

TEXT BOOKS:
1. Parallel computing theory and practice, Michel J. Quinn

REFERENCE BOOKS:
2. Introduction to Parallel Processing Algorithms and Architectures, Behrooz Parhami, Kluwer Publications, 2002
3. Introduction to Parallel Algorithms, Joseph JaJa, Pearson, 1992
COURSE OBJECTIVES:
1. To impart fundamental concepts of cloud computing.
2. To differentiate Parallel and distributed computing.
3. To impart knowledge in design of cloud computing.
4. To impart knowledge in applications of cloud computing.
5. To impart knowledge in different aspects of security in cloud computing.

COURSE OUTCOMES:
1. Understanding the protocols and mechanisms that support cloud computing
2. Understanding the hardware necessary for cloud computing
3. Understanding Cloud Resource Virtualization
4. Understanding Cloud Resource Management and Scheduling
5. Understand cloud security
6. Develop a novel cloud application

SYLLABUS

UNIT I:
Introduction: Network centric computing, Network centric content, peer-to-peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing
Parallel and Distributed Systems: introduction, architecture, distributed systems, communication protocols, logical clocks, message delivery rules, concurrency, model concurrency with Petri Nets.

UNIT II:
Cloud Infrastructure: At Amazon, The Google Perspective, Microsoft Windows Azure, Open Source Software Platforms, Cloud storage diversity, Inter cloud, energy use and ecological impact, responsibility sharing, user experience, Software licensing.
Cloud Computing: Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, The Map Reduce Program model, HPC on cloud, biological research

UNIT III:
Cloud Resource virtualization: Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization- full and para, performance and security isolation, hardware support for virtualization, Case Study: Xen, vBlades
Cloud Resource Management and Scheduling: Policies and Mechanisms, Applications of control theory to task scheduling, Stability of a two-level resource allocation architecture, feed back control based on dynamic thresholds, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines, Scheduling Map Reduce applications, Resource management and dynamic application scaling
UNIT IV:
**Storage Systems:** Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system, Apache Hadoop, Big Table, Megastore (text book 1), Amazon Simple Storage Service(S3) (Text book 2)
**Cloud Security:** Cloud security risks, security – atop concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks

UNIT V:
**Cloud Application Development:** Amazon Web Services : EC2 – instances, connecting clients, security rules, launching, usage of S3 in Java, Installing Simple Notification Service on Ubuntu 10.04, Installing Hadoop on Eclipse, Cloud based simulation of a Distributed trust algorithm, Cloud service for adaptive data streaming (Text Book1)
**Google:** Google App Engine, Google Web Toolkit (Text Book 2)
**Micro Soft:** Azure Services Platform, Windows live, Exchange Online, Share Point Services, Microsoft Dynamics CRM (Text Book 2)

TEXT BOOKS:

1. Cloud Computing, Theory and Practice, Dan C Marinescu, MKElsevier

REFERNCE BOOK:

MOBILE COMPUTING
(ELECTIVE-II)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:
1. Introduction of an advanced element of learning in the field of wireless communication.
2. Introduce the students to the concepts of wireless devices and mobile computing.
3. To introduce wireless communication and networking principles, that support connectivity to cellular networks, wireless internet and sensor devices.
4. To introduce various platforms for mobile computing.

COURSE OUTCOMES:
1. A working understanding of the characteristics and limitations of mobile hardware devices including their user-interface modalities
2. The ability to develop applications that are mobile-device specific and demonstrate current practice in mobile computing contexts.
3. A comprehension and appreciation of the design and development of context-aware solutions for mobile devices.
4. A student will be able to understand various protocols for mobile computing
5. A student will be able to understand various platforms for mobile computing
6. A student will be able to understand various routing algorithm.

SYLLABUS

UNIT- I
Introduction: Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices.
GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS.

UNIT –II
(Wireless) Medium Access Control (MAC): Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11)

UNIT –III
Mobile Network Layer: IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route Optimization, DHCP.

UNIT –IV
UNIT- V


Mobile Ad hoc Networks (MANETs): Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, etc., Mobile Agents, Service Discovery.


TEXT BOOKS:


REFERENCE BOOKS:

COURSE OBJECTIVES:
1. To understand the Object-oriented modelling using UML
2. To enable the student to get knowledge in SDLC
3. To give a detailed understanding of processes and techniques for building large object-oriented software systems.
4. To develop skills to evolve object-oriented systems from analysis, to design, to implementation
5. To develop skills to work as a team for developing a software project.
6. Introducing the various design approaches, models and metrics.

COURSE OUTCOMES:
1. To familiarize with modern software engineering methods and tools
2. To design complex software solutions.
3. To implement complex software solutions.
4. To test software.
5. To document software
6. To work as part of a software team
7. To develop significant projects

LIST OF EXPERIMENTS IN OOSE LAB:

The course is realized as a project-like assignment that can, in principle, by a team of three/four students working full time. Typically, the assignments have been completed during the semester. The project deliverables include

1. Documentation including
   2. A problem statement
      i. A requirements document
      ii. A Requirements Analysis Document.
4. A design document
6. Manuals/guides for
   i. Users and associated help frames
ii. Programmers

iii. Administrators (installation instructions)

7. A project plan and schedule setting out milestones, resource usage and estimated costs.

8. A quality plan setting out quality assurance procedures


REFERENCE BOOKS:

1. Project-based software engineering: An Object-oriented approach, Evelyn Stiller, Cathie LeBlanc, Pearson Education

2. Visual Modelling with Rational Rose 2002 and UML, Terry Quatrini, Pearson Education

3. UML2 Toolkit, Hans-Erik Eriksson, Wiley
COURSE OBJECTIVES:
The objectives of this course are to give students:
1. An applied understanding of the principles of network and computer security.
2. A hands-on experience in attack execution, and the use of tools in such attacks.
3. A hands-on experience in the use of intrusion detection techniques.
4. Data analysis using R
5. Practice data preprocessing using Weka
6. Practice classification using Weka
7. Practice Clustering using Weka

COURSE OUTCOMES:
1. Able to install Virtual Box or any other equivalent software on the host OS.
2. Able to use tool NMAP for information gathering.
3. Conduct network based attacks on networking infrastructure (Routing, Firewalls) using Wireshark.
5. Install and configure intrusion detection systems.
6. Able to use R in various applications
7. Performing data preprocessing using Weka
8. Performing classification using Weka
9. Performing Clustering using Weka

DATA ANALYTICS LAB LIST OF EXPERIMENTS:
1. Introduction to exploratory data analysis using R
   Load the ‘iris. CSV’ file and display the names and type of each column.
   Find statistics such as min, max, range, mean, median, variance, standard deviation for each column of data.
   Generate histograms and density plots for each sepal length, sepal width, petal length, petalwidth.
   Generate box plots for each of the numerical attributes. Identify the attribute with the highest variance.

2. Study of homogeneous and heterogeneous data structures such as vector, matrix, array, list, data frame in R.

3. Introduction to regression using R

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</table>
Use R to perform linear regression on the given data. Analyze the significance of residual standard-error value, R-squared value, F-statistic. Find the correlation coefficient for this data and analyze the significance of the correlation value. Use a Quantile-Quantile plot to determine whether the residuals are normally distributed. Perform a log transformation on the ‘Air Velocity’ column, perform linear regression again, and analyze all the relevant values.

4. Introduction to the Weka machine learning toolkit
   Create an ARFF (Attribute-Relation File Format) file and read it in WEKA. Explore the purpose of each button under the preprocess panel after loading the ARFF file. Also, try to interpret using a different ARFF file, weather.arff, provided with WEKA.

5. Performing data preprocessing in Weka – Part 1
   Study Unsupervised Attribute Filters such as Replace Missing Values to replace missing values in the given dataset, Add to add the new attribute Average, Discretize to discretize the attributes into bins. Explore Normalize and Standardize options on a dataset with numerical attributes.

6. Perform data preprocessing in Weka – Part 2
   Study the Unsupervised Instance Filters such as Remove Range filter to remove the last two instances, R

7. Classification using the Weka toolkit – Part 1
   Demonstration of classification process using id3 algorithm on categorical dataset (weather).
   Demonstration of classification process using naïve Bayes algorithm on categorical dataset (‘vote’).
   Demonstration of classification process using Random Forest algorithm on datasets containing large number of attributes.

8. Classification using the Weka toolkit – Part 2
   Demonstration of classification process using J48 algorithm on mixed type of dataset after discretizing numeric attributes.
   Perform cross-validation strategy with various fold levels. Compare the accuracy of the results.

9. Performing clustering in Weka
   Apply hierarchical clustering algorithm on numeric dataset and estimate cluster quality. Apply DBSCAN algorithm on numeric dataset and estimate cluster quality. Apply COBWEB clustering algorithm on categorical dataset and estimate cluster quality.

10. Association rule analysis in Weka
    Demonstration of Association Rule Mining on supermarket dataset using Apriori Algorithm.
    Demonstration of Association Rule Mining on supermarket dataset using FP-Growth Algorithm.
INFORMATION SECURITY LAB LIST OF EXPERIMENTS:

1. Learn to install Virtual Box or any other equivalent software on the host OS.
2. Perform an experiment to grab a banner with telnet and perform the task using Netcat.
3. Perform an experiment for Port Scanning with nmap.
4. Using nmap
   i) Find Open ports on a system.
   ii) Find machines which are active.
   iii) Find the version of remote OS on other systems.
   iv) Find the version of s/w installed on other system using nmap.
5. Perform an experiment on Active and Passive finger printing using XProbe2 and nmap.
6. Perform an experiment to demonstrate how to sniff for router traffic by using the tool wireshark.
7. Perform wireless audit of an access point / router and decrypt WEP and WPA (softwares- nets tumbler or airsniff).
8. Install JCrypttool and demonstrate Asymmetric, Symmetric crypto algorithm, Hash and Digital signatures studied in theory Network Security and Management.

REFERENCE BOOKS:

SCHEME OF INSTRUCTION & EXAMINATION
(Regulation R17)

M.TECH (COMPUTER SCIENCE & TECHNOLOGY)
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
(With effect from 2017-2018 Admitted Batch onwards)
Under Choice Based Credit System

III-SEMESTER

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1. The Viva-Voce for the Comprehensive Viva-Voce and Seminar-I shall be held with the Project Guide, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.
2. Candidates can do their Project Work Part-I&II work within the department or in any industry/research organization for two semesters (i.e. 3rd and 4th semesters). In case of thesis done in an industry/research organization, one advisor (Guide) should be from the department and one advisor (Co-Guide) should be from the industry/research organization.
3. The Project Work Part-I should be submitted at the end of 3rd Semester and it will be evaluated through Review by a committee consisting of Head of the Department, PG coordinator and Project guide. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.
SCHEME OF INSTRUCTION & EXAMINATION
(Regulation R17)

M.TECH (COMPUTER SCIENCE & TECHNOLOGY)
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
(With effect from 2017-2018 Admitted Batch onwards)
Under Choice Based Credit System

IV-SEMESTER

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1. The viva-voce for Seminar-II shall be held with the Project Guide, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.

2. A publication of a paper on the thesis work in a National/International Journal at the end of 4th semester is mandatory for the submission of thesis work.

3. The Project Work Part-II should be submitted at the end of 4th semester and it will be evaluated through Viva–Voce examination by a committee consisting of External Examiner, Head of the Department, Project guide and PG coordinator. The marks shall be awarded in the ratio of 40, 20, 20 and 20 Marks by the members respectively.
M.TECH (COMMUNICATION SYSTEMS)  
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING  

(With effect from 2017-2018 Admitted Batch onwards)  
Under Choice Based Credit System  

I-SEMESTER  

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DETECTION & ESTIMATION THEORY

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int. Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:

1. To enable the students to acquire the fundamental concepts of Signal Detection and Estimation
2. To get familiarize with different Hypotheses in detection and estimation problems
3. To introduce the methods of Detection and estimation of signals in white and non-white Gaussian noise.
4. To familiarize with the detection of random signals.
5. To enable the students to understand the time varying waveform detection and its estimation

COURSE OUTCOMES:

Students would be able to

1. Understand the basic concepts of signal detection and estimation
2. Understand different hypotheses in detection and estimation problems
3. Understand the conceptual basics of detection and estimation of signals in white and non-white Gaussian noise
4. Understand the detection of random signals
5. Understand the time varying waveform detection and its estimation
6. Appreciate the need for estimation techniques in Communication and Signal Processing problems and acquire expertise in Classical and Bayesian estimation techniques for parameters and signals, and Detection of signals in the presence of white Gaussian noise.
7. Conduct in-depth analysis of estimation problems and apply suitable estimation and detection techniques that meet the constraints of the problem such as performance, bandwidth and power overheads and computational complexity

SYLLABUS

UNIT I:
Random Processes:
Discrete Linear Models, Markov Sequences and Processes, Point Processes, and Gaussian Processes.

UNIT II:
Detection Theory:
Basic Detection Problem, Maximum A posteriori Decision Rule, Minimum Probability of Error Classifier, Bayes Decision Rule, Multiple-Class Problem (Bayes)- minimum probability error with and without equal a priori probabilities, Neyman-Pearson Classifier, General Calculation of Probability of Error, General Gaussian Problem, Composite Hypothesis
UNIT –III:
Linear Minimum Mean-Square Error Filtering:
Linear Minimum Mean Squared Error Estimators, Nonlinear Minimum Mean Squared Error Estimators. Innovations, Digital Wiener Filters with Stored Data, Real-time Digital Wiener Filters, Kalman Filters.

UNIT –IV:
Statistics:

UNIT –V:
Estimating the Parameters of Random Processes from Data:

TEXT BOOKS:

REFERENCE BOOKS:
3. Introduction to Statistical Signal Processing with Applications - Srinath, Rajasekaran, Viswanathan, 2003, PHI.
COURSE OBJECTIVES:

1. Provide comprehensive coverage of digital data communication principles and terminology.
2. Provide an understanding of the standard architectural structure of computer networks and protocols.
3. Provide an in-depth understanding of the Physical Layer and Data Link Layer modeling and engineering.
4. Study a comprehensive coverage of physical and logical network topologies.

COURSE OUTCOMES:

1. Understand the basic concepts of LAN and WAN technologies and topologies.
2. Demonstrate an understanding of the elements of a protocol, and the concept of layering.
3. Recognize the importance of networking standards, and their regulatory committees.
4. Develop an understanding of the seven layers of the OSI model.
5. Understand signals and signal encoding methods to communication service methods and data transmission modes.
6. Demonstrate an understanding of basic concepts of error detection and correction at the data link layer and below.
7. Develop an understanding of Data Link Layer protocols and technologies.
8. Demonstrate an understanding of the differences between circuit switching and packet switching.

SYLLABUS

UNIT -I:
Digital Modulation Schemes:
BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK – Methods, Band Width Efficiency, Carrier Recovery, Clock Recovery.

UNIT -II:
Basic Concepts of Data Communications, Interfaces and Modems:

UNIT -III:
Error Correction: Types of Errors, Vertical Redundancy Check (VRC), LRC, CRC, Checksum, Error Correction using Hamming code
Data Link Control: Line Discipline, Flow Control, Error Control
UNIT -IV:
**Multiplexing:** Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Multiplexing Application, DSL.

**Local Area Networks:** Ethernet, Other Ether Networks, Token Bus, Token Ring, FDDI.

**Metropolitan Area Networks:** IEEE 802.6, SMDS

**Switching:** Circuit Switching, Packet Switching, Message Switching.

**Networking and Interfacing Devices:** Repeaters, Bridges, Routers, Gateway, Other Devices.

UNIT -V:

**Multiple Access Techniques:**
Frequency- Division Multiple Access (FDMA), Time - Division Multiple Access (TDMA), Code - Division Multiple Access (CDMA), OFDM and OFDMA. Random Access, Aloha- Carrier Sense Multiple Access (CSMA)- Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), Controlled Access- Reservation- Polling- Token Passing, Channelization.

**TEXT BOOKS:**

**REFERENCE BOOKS:**
1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
COURSE OBJECTIVES:

1. To study the concepts of information, entropy, mutual information and study the Shannon’s fundamental limits, theorems on information transmission.
2. To introduce and classify the error correcting codes and understand the encoding and decoding of various linear block codes, convolutional codes.
3. To know the mathematical description of error correcting codes.
4. To introduce the extension field called Galois field and their role in the design of BCH and RS codes.
5. To study the applications of error correcting codes.

COURSE OUTCOMES:

After completion of the course, students will be able to

1. Analyze the information theoretic problems from various disciplines like computer science, mathematics, statistics and communication engineering.
2. Apply coding techniques in various communication systems like wireless communications to achieve coding gain at low SNR values.
3. Build new structures for encoder and decoder to address the issues in evaluating performance of communication systems.
4. Implement coding techniques in real-time systems.

SYLLABUS

UNIT – I: Coding for Reliable Digital Transmission and Storage:
Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

Linear Block Codes:
Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for error control in data storage systems.

UNIT – II: Cyclic Codes:
Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.
UNIT –III: Convolutional Codes:
Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority-logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT –IV:
Burst –Error-Correcting Codes:

UNIT-V: BCH- CODES
BCH code- Definition, Minimum distance and BCH Bounds, Decoding Procedure for BCH Codes- Syndrome Computation and Iterative Algorithms, Error Location Polynomials and Numbers for single and double error correction

TEXT BOOKS:

REFERENCE BOOKS:
1. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
3. Introduction to Error Control Codes-Salvatore Gravano-oxford
5. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Ed, 2009, TMH.
COURSE OBJECTIVES:

1. To study the in-depth treatment on methods and techniques in discrete-time signal transforms, digital filter design, optimal filtering.
2. To study the power spectrum estimation, multi-rate digital signal processing
3. To study the DSP architectures which are of importance in the areas of signal processing, control and communications.

COURSE OUTCOMES:

On Successful completion of this course the students will be able to
2. To design adaptive filters for a given application
3. To design multi rate DSP systems
4. Learn Applications of Multi rate signal processing
5. Analyze complex engineering problems critically for conducting research in Adaptive filter design
6. Solve engineering problems by designing computationally efficient DSP algorithms for feasible and optimal solutions in digital signal processing field
7. Contribute to scientific research in signal processing and inter disciplinary areas like cellular mobile communications, multi rate signal processing and spectral analysis.

SYLLABUS

UNIT –I:
Review of DFT, FFT, IIR Filters and FIR Filters:

Multi Rate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion.

UNIT –II:
Applications of Multi Rate Signal Processing:


UNIT –III:
Non-Parametric Methods of Power Spectral Estimation: Estimation of spectra from finiteduration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods
UNIT –IV:
Implementation of Digital Filters:
Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT –V:

TEXT BOOKS:

REFERENCE BOOKS:
COURSE OBJECTIVES:

1. To study the Radar Signal acquisition and sampling in multiple domains
2. To provide clear instruction in radar DSP basics
3. To equip the skills needed in both design and analysis of common radar algorithms
4. To study the basics of synthetic aperture imaging and adaptive array processing
5. To study how theoretical results are derived and applied in practice

COURSE OUTCOMES:

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

1. Demonstrate knowledge in Characteristics of matched filter, Detection criteria of radar signals in noise environment, Radar waveform design requirements, Pulse compression techniques, Different coding techniques.
2. Develop skills in designing Radar systems in different noise environments.
3. Apply appropriate techniques for radar signal de-noising.

SYLLABUS

UNIT -I:
Introduction:

UNIT -II:
Detection of Radar Signals in Noise:
UNIT -III:
Waveform Selection:

UNIT -IV:
Pulse Compression in Radar Signals:

UNIT V:
Phase Coding Techniques:
Principles, Binary Phase Coding, Barker Codes, Maximal Length Sequences (MLS/LRS/PN), Block Diagram of a Phase Coded CW Radar.
Poly Phase Codes : Frank Codes, Costas Codes, Non-Linear FM Pulse Compression, Doppler Tolerant PC Waveforms – Short Pulse, Linear Period Modulation (LPM/HFM), Sidelobe Reduction for Phase Coded PC Signals.

TEXT BOOKS:

REFERENCE BOOKS:
COURSE OBJECTIVES:

1. To provide students with the design and operating principles of modern optical communication systems and networks.
2. To study the commonly used components and subsystems in optical communication and network systems.
3. To design a simple optical communication link.

COURSE OUTCOMES:

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

1. Demonstrate Knowledge in Linear and Non-linear Characteristics of Optical fiber, Fiber design considerations, Minimization of Losses in Cable design, Understanding the operation of advanced fiber optic components, Modulation and demodulation techniques, Access networks.
2. Analyze complex engineering problems critically in the domain of optical communication for conducting research.
3. Formulate solutions to problems related to optical communication to meet societal and industrial needs.
4. Apply appropriate techniques to complex engineering activities in the field of communication networks.

SYLLABUS

UNIT –I:
Signal propagation in Optical Fibers:

UNIT –II:
Fiber Optic Components for Communication & Networking:
Couplers, Isolators and Circulators, Multiplexers, Bragg Gratings, Fabry-Perot Filters, Mach Zender Interferometers, Arrayed Waveguide Grating, Tunable Filters, High Channel Count Multiplexer Architectures, Optical Amplifiers, Direct and External Modulation Transmitters, Pump Sources for Amplifiers, Optical Switches and Wavelength Converters.
UNIT –III:
Modulation and Demodulation:

UNIT -IV:
Transmission System Engineering:
System Model, Power Penalty in Transmitter and Receiver, Optical Amplifiers, Crosstalk and Reduction of Crosstalk, Cascaded Filters, Dispersion Limitations and Compensation Techniques.

UNIT –V:
Fiber Non-linearities and System Design Considerations:
Limitation in High Speed and WDM Systems due to Non-linearities in Fibers, Wavelength Stabilization against Temperature Variations, Overall System Design considerations – Fiber Dispersion, Modulation, Non-Linear Effects, Wavelengths, All Optical Networks.

TEXT BOOKS:

REFERENCE BOOKS:
ADVANCED COMPUTER NETWORKS
(ELECTIVE-I)

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COURSE OBJECTIVES:

1. To study the state-of-the-art in network protocols, architectures and applications.
2. To study and Analyze existing network protocols and networks.
3. To Develop new protocols in networking
4. To understand how networking research is done
5. To investigate novel ideas in the area of Networking via term-long research projects.

COURSE OUTCOMES:

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

1. Configure PCs running Linux so that they receive IP addresses, have default routes, can resolve host names, and so on. (And similarly for Windows, if time permits.)
2. Apply knowledge of the TCP/IP layering model to intelligently debug networking problems.
3. Use Linux commands to understand how a PC is configured.
4. Differentiate between different LAN-based forwarding devices so that they can make thoughtful suggestions on how to build a network.
5. Write networking code that uses TCP and UDP in client-server applications.

SYLLABUS

UNIT -I:
Congestion and Quality of Service (QoS):
Data traffic, Congestion, Congestion Control, Two examples, Quality of Service, Techniques to improve QOS, Integrated Services and Differential services. Queue Management: Passive-Drop trial, Drop front, Random drop, Active- early Random drop, Random Early detection.

UNIT -II:

UNIT -III:
UNIT -IV:

**Spread Spectrum:** Introduction, Basic concept, Protection against Jamming, Spreading codes (PN sequence), Generation, Properties, Types of Spread Spectrum Modulation, Application of Spread Spectrum. **Private Networks:** Virtual Private Networks, Network Address Translation **Next Generation:** IPV6 Transition from IPV4 to IPV6 **Mobile IP:** Addressing, Agents, Three phases, Inefficiency in Mobile IP

UNIT -V:

**Wireless Networks:** **Wireless LAN:** IEEE802.11, Architecture, MAC Sub Layer, Addressing Mechanism, Physical Layer. **Bluetooth:** Architecture, Bluetooth layers, Radio layer, Base band layer, L2CAP, **Wireless WAN:** The Cellular Concept, Cell, Frequency reuse, Principle, Channel Assignment Strategies, Interference and system capacity. Types of interference, Improving capacity in cellular system, Handoff, AMPS, D-AMPS, GSM, CDMA, GPRS, 3G & 4G technologies.

**TEXT BOOKS:**

1. Data Communication and Networking - B. A. Forouzan, 4th Ed, TMH

**REFERENCE BOOKS:**

1. Wireless Communication System- Abhishek Yadav, University Sciences Press
2. Wireless Digital Communications – Kamilo Feher, 1999, PHI
3. High Performance TCP-IP Networking- Mahaboob Hassan, Jain Raj, PHI
COURSE OBJECTIVE:

1. To study the different generations of mobile networks, WAN and PAN.
2. To understand the concepts of basic cellular system, frequency reuse, channel assignment strategies, handoff strategies, interference.
3. To understand the FDMA, TDMA, spread spectrum multiple access.
4. To study the concepts mobile environment, communication in the infrastructure, IS-95 CDMA forward channel, IS-95 CDMA risers channel, packet and frame formats in IS-95, IMT-2000.
5. To understand the evolution of the WAN industry, wireless home networking IEEE 802.11 the PHY layer.

COURSE OUTCOMES:

After the completion of the course Students will be

1. Able to understand the second generation cellular networks, third generation wireless networks, wireless in local loop, wireless local area networks, Bluetooth and personal area networks.
2. Able to understand the concepts of spectrum allocation, basic cellular system, frequency reuse, channel assignment strategies, handoff strategies, interference, improving coverage and capacity, cell splitting.
3. Able to understand various multiple accesses techniques: FDMA, TDMA, spread spectrum multiple access, SDMA.
4. Able to understand the communication in the infrastructure, IS-95 CDMA forward channel, IS-95 CDMA risers channel, packet and frame formats in IS-95, IMT-2000, forward channel in W-CDMA.
5. Able to understand the Historical overviews of the land industry, evolution of the wan industry, wireless home networking IEEE 802.11 the physical layer, MAC layer wireless ATM.

SYLLABUS

UNIT – I:

Wireless System & Random Access Protocols:

UNIT –II:
Wireless LANs:
Introduction, importance of Wireless LANs, WLAN Topologies, Transmission Techniques: Wired Networks, Wireless Networks, comparison of wired and Wireless LANs; WLAN Technologies: Infrared technology, UHF narrowband technology, Spread Spectrum technology

UNIT –III:
The IEEE 802.11 Standard for Wireless LANs:
Network Architecture, Physical layer, The Medium Access Control Layer; MAC Layer issues: Hidden Terminal Problem, Reliability, Collision avoidance, Congestion avoidance, Congestion control, Security, The IEEE 802.11e MAC protocol

UNIT –IV:
Wireless PANs:
Introduction, importance of Wireless PANs, The Bluetooth technology: history and applications, technical overview, the Bluetooth specifications, piconet synchronization and Bluetooth clocks, Master-Slave Switch; Bluetooth security; Enhancements to Bluetooth: Bluetooth interference issues, Intra and Inter Piconet scheduling, Bridge selection, Traffic Engineering, QoS and Dynamics Slot Assignment, Scatternet formation.

UNIT –V:
The IEEE 802.15 working Group for WPANs:
The IEEE 802.15.3, The IEEE 802.15.4, ZigBee Technology, ZigBee components and network topologies, The IEEE 802.15.4 LR-WPAN Device architecture: Physical Layer, Data Link Layer, The Network Layer, Applications; IEEE 802.15.3a Ultra wideband.

TEXT BOOKS:

REFERENCE BOOKS
MOBILE COMPUTING TECHNOLOGIES
(ELECTIVE-II)

Lecture : 3 Periods  Int.Marks : 30
Tutorial : 1 Period.  Ext. Marks : 70
Exam : 3 Hrs.  Credits : 3

COURSE OBJECTIVES:
1. To acquire Knowledge of WAP, Wireless Lan
2. To study client programming and different OS architectures.
3. To learn J2ME technology and Mobile VoIP
4. To become familiar with Security issues in Mobile Computing

COURSE OUTCOMES:
On successful completion of this course the students will be able to
1. Apply advanced data communicating methods and networking protocols for wireless and mobile environments
2. Utilize and employ application frameworks for developing mobile applications including under disconnected and weakly connected environment
3. Create web sites suitable for mobile environments
4. Select components and networks for particular application
5. Creatively analyze mobile and wireless networks
6. Critically analyze security issues of mobile and wireless computing systems

SYLLABUS

UNIT –I:
Introduction to Mobile Computing Architecture:

UNIT –II:
Cellular Technologies: GSM, GPS, GPRS, CDMA and 3G
UNIT –III:

**Wireless Application Protocol (WAP) and Wireless LAN:**

**Intelligent Networks and Interworking:**
Introduction – Fundamentals of Call processing – Intelligence in the Networks – SS#7 Signaling – IN Conceptual Model (INCM) – soft switch – Programmable Networks – Technologies and Interfaces for IN

UNIT –IV:

**Client Programming, Palm OS, Symbian OS, Win CE Architecture:**


UNIT –V:

**Voice Over Internet Protocol and Convergence:**


TEXT BOOKS:

REFERENCE BOOKS:
COURSE OBJECTIVES:

1. To give a clear insight into cryptography, authentication and emerging security standards.
2. To impart knowledge on network security protocols.

COURSE OUTCOMES:

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

1. Acquire thorough knowledge about Encryption Algorithms
2. Acquire thorough knowledge about cryptography
3. Acquire thorough knowledge about techniques for access control and Email security.
4. Develop security algorithms in the network.

SYLLABUS

UNIT -I:
Introduction:
Modern Techniques:
Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations.

UNIT -II:
Encryption Algorithms:

UNIT -III:
UNIT -IV:

**Message Authentication and Hash Functions:** Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.

**Hash and Mac Algorithms:** MD File, Message digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC. Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards.

**Authentication Applications:** Kerberos, X.509 directory Authentication service. Electronic MailSecurity: Pretty Good Privacy, S/MIME.

UNIT –V:

**IP Security:**

**Intruders, Viruses and Worms**
Intruders, Viruses and Related threats.

**Fire Walls:** Fire wall Design Principles, Trusted systems.

**TEXT BOOKS:**

**REFERENCE BOOKS:**
1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
5. Introduction to Cryptography, Buchmann, Springer.
COURSE OBJECTIVES:

1. Understand and measure the basic properties of the propagation of light in a guided-wave dielectric optical fiber, including attenuation, coupling, and handling
2. To study various optical sources and detectors and their use in both analog & digital in the optical communication systems
3. To study the optical devices and to use in appropriate application
4. To study the analog & digital link set up using a fiber in detail
5. Understand the pc-to-pc communication using parallel port
6. To study of LAN using star topology, bus topology and tree topology and configure modem of a computer

COURSE OUTCOMES:

1. Students can identify the type of fiber optical cable and test their applications
2. Students will have the awareness to select appropriate optical source and detector for different applications
3. Students can operate and modify the setting in any kind of microwave equipments
4. Understand the fundamental concepts of data communications and networking
5. Identify different components and their respective roles in a computer communication system.
6. Apply the knowledge, concepts and terms related to data communication and networking.
7. Solve problems in networking by referring to problems solving steps through relevant information by choosing suitable techniques.
8. Acquaint them-selves with networking software simulation tools, configuring of networking devices and understand their functionality.
9. Know the strategies for securing network applications
10. Appreciate usefulness and importance of computer communication in today life and society.

SYLLABUS

OPTICAL COMMUNICATIONS EXPERIMENTS

1. D.C Characteristics of light sources /detectors (LED, Laser diode and PIN photo diode.)
3. Analog link set up using a fiber
4. Digital link set up using a fiber
5. Set up of time division multiplexing using fiber optics
6. Digital Fiber Optical Transmitter and Receiver
DATA COMMUNICATIONS EXPERIMENTS

8. Study of serial interface RS – 232
9. Study of pc to pc communication using parallel port
10. To establish pc-pc communication using LAN
11. Study of LAN using star topology, bus topology and tree topology
12. Study and configure modem of a computer
13. To configure a hub/switch
14. To study the interconnections of cables for data communication
15. Study of a wireless communication system

REFERENCE BOOKS:
3. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
# SCHEME OF INSTRUCTION & EXAMINATION
(Regulation R17)

M.TECH (COMMUNICATION SYSTEMS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

(With effect from 2017-2018 Admitted Batch onwards)
Under Choice Based Credit System

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RF CIRCUIT DESIGN

Lecture : 3 Periods  Int. Marks : 30
Tutorial : 1 Period.  Ext. Marks : 70
Exam : 3 Hrs.  Credits : 3

COURSE OBJECTIVES:

1. To design and analyze single and multiport networks and RF Filters.
2. To study the operation and device characteristics of RF Active components.
3. To design and analyze RF transistor amplifier.
4. To study the operation of Oscillators and mixers used in RF design

COURSE OUTCOMES:

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

1. Demonstrate advanced knowledge in RF Electronics Transmission line analysis, Matching and biasing networks, RF Passive and Active component, RF Transistor amplifier design, Oscillators and RF Mixers

2. Analyze complex problems critically in the domains of RF field, RF Passive and Active components as well as a smart antenna techniques for better spectrum exploitation for conducting research

3. Solve engineering problems to arrive at optimal solutions in compliance with public health and safety, cultural, societal and environmental factors in the core areas of RF Circuit design

SYLLABUS

UNIT -I:
Introduction to RF Electronics:

UNIT -II:

UNIT -III:
Matching and Biasing Networks:
UNIT -IV:

UNIT -V:
**Oscillators**: Oscillator basics, Low phase noise oscillator design, High frequency Oscillator configuration, LC Oscillators, VCOs, Crystal Oscillators, PLL Synthesizer, and Direct Digital Synthesizer. **RF Mixers**: Basic characteristics of a mixer - Active mixers- Image Reject and Harmonic mixers, Frequency domain considerations.

**TEXT BOOKS:**

**REFERENCE BOOKS:**
1. Radio frequency and Microwave Electronics - Mathew M. Radmangh, 2001, PE Asia Publ.
COURSE OBJECTIVES:

1. To provide an overview of Wireless Communication networks area and its applications in communication engineering.
2. To appreciate the contribution of Wireless Communication networks to overall technological growth.
3. To understand the various terminology, principles, devices, schemes, concepts, algorithms and different methodologies used in Wireless Communication Networks.

COURSE OUTCOMES:

After completion of the course, students

1. Understand the basics of Wireless Communication Networks.
2. Learn about path losses in Mobile Radio Propagation and different path loss models.
3. Learn different types of small scale fading and simulation of different fading models.
4. Learn different Equalization and Diversity algorithms.
5. Learn advantages and disadvantages of WLAN and various IEEE standards

SYLLABUS

UNIT -I:
The Cellular Concept-System Design Fundamentals:
Introduction, Frequency Reuse, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference, Power Control for Reducing interference, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Trunking and Grade of Service

UNIT –II:
Mobile Radio Propagation: Large-Scale Path Loss:
UNIT –III:
Mobile Radio Propagation: Small –Scale Fading and Multipath
Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke’s model for flat fading, spectral shape due to Doppler spread in Clarke’s model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

UNIT -IV:
Equalization and Diversity

UNIT -V:
WirelessNetworks
Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, HiperLan, WLL.

TEXT BOOKS:

REFERENCE BOOKS:
2. Wireless Digital Communications – KamiloFeher, 1999, PHI.
IMAGE AND VIDEO PROCESSING

Lecture: 3 Periods  Int. Marks: 30
Tutorial: 1 Period.  Ext. Marks: 70
Exam: 3 Hrs.  Credits: 3

COURSE OBJECTIVES:
1. To understand representation of digital images and video in the spatial (pixel) and frequency domains, and learn common digital video formats.
2. To understand spatial and temporal resolution and aliasing; basic image and video filtering operations; principles and methods of motion/optical flow estimation; fundamentals of image compression and video compression.
3. To learn recent image and video compression standards; basics of video transport over the Internet.
4. To implement image and video processing algorithms using MATLAB or another programming language;

COURSE OUTCOMES:
After undergoing this course, students will be able to:
1. Demonstrate sufficient understanding of theory of image and video processing including image/video representation, image/video filtering, image/video compression, and transport over the Internet.
2. Analyze and interpret the results of image processing methods and algorithms.
3. Demonstrate the ability to implement basic image/video processing operations using MATLAB.
4. Implement a complete image processing system to achieve a specific task, and analyze and interpret the results of this system.

SYLLABUS

UNIT –I:
Fundamentals of Image Processing and Image Transforms:
Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing.Introduction, Need for transform, image transforms, Fourier transform, 2 D Discrete Fourier transform and its transforms, Importance of phase, Walsh transform, Hadamard transform, Haar transform, slant transform Discrete cosine transform, KL transform, singular value decomposition, Radon transform, comparison of different image transforms.

UNIT –II:
Image Enhancement:

Image Restoration:
Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind deconvolution
UNIT –III: Image Segmentation:
Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation, Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking, Hough transform, Active contour

Image Compression:

UNIT -IV: Basic Steps of Video Processing:

UNIT –V: 2-D Motion Estimation:
Optical flow, General Methodologies, Pixel Based Motion Estimation, Block- Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

TEXT BOOKS:

REFERENCE BOOKS:
SOFTWARE DEFINED RADIO

COURSE OBJECTIVES:

1. To study the fundamental radio components and how these components are implemented in software.
2. To study the principles of software architecture to support and develop the SDR.
3. To study Policy and cooperation mechanisms that enable SDR to interoperate.
4. To study and build SDR and investigate their role in future communication systems.

COURSE OUTCOMES:

1. Understanding of analog RF components as front end block in implementation of SDR.
2. Design circuits at different multirate signalling technique for frequency conversion and Sampling issues.
3. Understanding of ADC and DAC technology.
4. Knowledge of Hardware and software development methods for embedded wireless systems
5. Make system-level decisions for software defined radio technology and products.

SYLLABUS

UNIT -I:
Introduction:

The Need for Software Radios, What is Software Radio, Characteristics and benefits of software radio- Design Principles of Software Radio, RF Implementation issues- The Purpose of RF Front – End, Dynamic Range- The Principal Challenge of Receiver Design – RF Receiver Front- End Topologies- Enhanced Flexibility of the RF Chain with Software Radios-Importance of the Components to Overall Performance- Transmitter Architectures and Their Issues- Noise and Distortion in the RF Chain, ADC and DAC Distortion.

UNIT -II:
Multi Rate Signal Processing:

Introduction- Sample Rate Conversion Principles- Polyphase Filters- Digital Filter Banks- Timing Recovery in Digital Receivers Using Multirate Digital Filters.

Digital Generation of Signals:

UNIT -III:
Analog to Digital and Digital to Analog Conversion:
Parameters of ideal data converters- Parameters of Practical data converters- Analog to Digital and Digital to Analog Conversion- Techniques to improve data converter performance-Common ADC and DAC architectures.

UNIT -IV:
Digital Hardware Choices:
Introduction- Key Hardware Elements- DSP Processors- Field Programmable Gate Arrays-Trade-Offs in Using DSPs, FPGAs, and ASICs- Power Management Issues- Using a Combination of DSPs, FPGAs, and ASICs.

UNIT -V:
Object – Oriented Representation of Radios and Network Resources:
Networks- Object Oriented Programming- Object Brokers- Mobile Application Environments-Joint Tactical Radio System.

TEXT BOOKS:

REFERENCE BOOKS:
SOFT COMPUTING TECHNIQUES  
(ELECTIVE-III)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int. Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:
1. To study the soft computing basics and branches.
2. To Understand the basic implementation details on Artificial Neural Networks
3. To understand fuzzy logic and it application in ANN.
4. To study the Genetic algorithm and its application
5. To study the applications of Soft Computing.

COURSE OUTCOME:
After undergoing the course, students will be able to
2. Understand and apply Artificial Neural Networks, Fuzzy Logic, and Genetic algorithms for different applications.
3. Understand various applications of soft computing.

SYLLABUS

UNIT –I:
Introduction:
Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems.

UNIT –II:
Artificial Neural Networks:
Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT –III:
Fuzzy Logic System:
Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear timedelay system.
UNIT –IV:
Genetic Algorithm:
Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and and-colony search techniques for solving optimization problems.

UNIT –V:
Applications:

TEXT BOOKS:

REFERENCE BOOKS:
SMART ANTENNAS
(ELECTIVE-III)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

COURSE OBJECTIVES:

1. To understand the development of smart antennas and types of arrays possible.
2. To understand the concepts of narrowband and wide band processing.
3. To introduce to the students the various adaptive processing techniques.
4. To learn the various methods of AOA estimation.
5. To study the different diversity combining techniques

COURSE OUTCOMES:

On completion of this course, students will be able to

1. Understand the applications of smart antennas.
2. Know the various processing techniques.
3. Discuss about design and simulation of various AOA estimation techniques using software.
4. Know the different diversity combining techniques and their significance.
5. Know the Adaptive Algorithm Classification
6. Know Direction of Arrival Estimation methods

SYLLABUS

UNIT I

UNIT II
Adaptive Beamforming: Least Mean Squares (LMS), Sample Matrix Inversion (SMI), Recursive Least Squares (RLS), Constant Modulus (CM), Least Squares Constant Modulus, Conjugate Gradient (CG) Method, Spreading Sequence Array Weights, Description of the new SDMA receiver.
UNIT III


UNIT IV


UNIT V

Smart Antenna Performance: Beam forming Array Performance, Receive Diversity Performance, Combined Diversity and Beam forming Performance, Choosing a Spatial Processing Technique, Multi User Modulation Schemes.

TEXT BOOKS:


REFERENCE BOOKS:

SECURE COMMUNICATIONS
(ELECTIVE-III)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

COURSE OBJECTIVES:
1. To Conceptualize the necessity of Security.
2. To understand the process involved in data modelling.
3. To analyze and handle security risks.
4. To understand latest technologies on security.

COURSE OUTCOMES:

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

1. Conceptualize the necessity of Security.
2. Understand the process involved in data modelling.
3. Analyze and handle security risks.
4. Understand latest technologies on security.

SYLLABUS

UNIT-I

UNIT-II

UNIT-III
UNIT-IV

UNIT-V

TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:
To learn about
1. Various components of optical networks
2. Multiplexing techniques and fiber characteristics
3. First generation and broadcast optical network
4. Network management and access networks
5. Various photonic switches

COURSE OUTCOMES:
After the course the students should be able to:
1. Solve a simple WDM network design and optimization problem.
2. Define the main limitations and possibilities of the optical network technologies.
3. Define the main differences between optical networking and traditional networking.
4. Explain the benefits of optical layer survivability.
5. Describe the main issues in management and control of optical networks.

SYLLABUS

UNIT –I:
Client Layers of Optical Networks:

UNIT -II:
WDM network Elements and Design:

UNIT –III:
Network Control and Management:
UNIT –IV:
Network Survivability:

UNIT –V:
Access Networks and Photonic Packet Switching:
Network Architecture, Enhanced HFC, FTTC, Photonic Packet Switching – OTDM, Synchronization, Header Processing, Buffering, Burst Switching, Test Beds.

TEXT BOOKS:


REFERENCE BOOKS:

DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES
(ELECTIVE-IV)

Lecture : 3 Periods  Int.Marks : 30
Tutorial : 1 Period.  Ext. Marks : 70
Exam : 3 Hrs.  Credits : 3

COURSE OBJECTIVES:

1. To study the basic DFT, FFT and rate conversion algorithms.
2. To study the number format, dynamic range and sources of errors in DSP systems.
3. To learn about TMS programmable DSPs and their programming capabilities.
4. To understand basic DSP algorithms on TMS processors.
5. To study the FFT algorithms on TMS320C54XX DSP device.

COURSE OUTCOMES:

After undergoing the course, students will be able to

1. Apply DFT and FFT algorithms for DSP application.
2. Apply the number format, dynamic range and various sources of errors in DSP system.
3. Implement application programs on a DSP processor.
4. Implement various DSP algorithms on TMS processors.
5. Implement FFT algorithms on TMS320C54XX DSP algorithm.

SYLLABUS

UNIT –I:
Introduction to Digital Signal Processing:
Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.

Computational Accuracy in DSP Implementations:
Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT –II:
Architectures for Programmable DSP Devices:
Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.
UNIT -III:
Programmable Digital Signal Processors:
Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline operation of TMS320C54XX Processors.

UNIT –IV:
Analog Devices Family of DSP Devices:
Introduction to Blackfin Processor - The Blackfin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

UNIT –V:
Interfacing Memory and I/O Peripherals to Programmable DSP Devices:
Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

TEXT BOOKS:

REFERENCE BOOKS:
4. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI
INTERNET OF THINGS
(ELECTIVE-IV)

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COURSE OBJECTIVES:

1. To know about the new paradigm of objects interacting with people, with information systems, and with other objects.
2. To focus on hands-on project development to find innovative applications of combinations of IoT technologies in real-life scenarios.

COURSE OUTCOMES:

After the completion of the course, Students will be able to

1. Identify and describe different kinds of Internet-connected product concepts.
2. Analyze, design and develop prototypes models of Internet-connected products using various tools.
3. Understand the challenges and apply right techniques for user-interaction with connected-objects.

SYLLABUS

UNIT – I
Introduction: IoT overview, The IoT paradigm, Smart objects, IoT Platforms (like Aurdino, ARM Cortex, Raspberry Pi / Intel Galileo), Bits and atoms, Convergence of Technologies.
Introduction to Internet and web networking basics: HTTP, Rest, JSON, XML, Interfacing to Cloud Harnessing mobile computing for IoT.

UNIT – II
Introduction to Technologies behind IoT: RFID, NFC, Mobil Data Technologies (GPRS, 3G, 4G), Wifi. Powering the IoT using low power wireless technologies like Bluetooth smart technology, Zigbee. WSN, RTLS + GPS Agents and Multiagent systems.

UNIT – III
UNIT – IV

UNIT – V
Case Studies and Guest lectures from Industry (for different verticals like Retail, Healthcare, Home Automation etc).

TEXT BOOKS
1. 6LoWPAN: The Wireless Embedded Internet, Zach Shelby, Carsten Bormann, Wiley.
2. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, Dr. Ovidiu Vermesan, Dr. Peter Friess, River Publishers.

REFERENCE BOOKS:
ADVANCED COMMUNICATIONS LABORATORY

Lab : 3 Periods     Int. Marks : 50
Exam : 3 Hrs        Ext. Marks : 50
Credits : 2

COURSE OBJECTIVES:

The objectives of this course are:
1. To simulate various advanced communication techniques using MATLAB.
2. To get better understanding of convolutional encoder and fiber losses.
3. Understand the implementations of FIR & IIR filters using DSP trainer kit.
4. To study the spread spectrum modulations and demodulations using kit.

COURSE OUTCOMES:

After completion of the course, the student is able to
1. Calculate BER using binary data.
2. Understand the importance of various filter implementations using DSP trainer kit.
3. Understanding the Waveforms at various test points of a mobile phone using Mobile Phone Trainer.
4. Studying the Performance of spread spectrum communication system.

SYLLABUS

Note:
A. Minimum of 10 Experiments have to be conducted
B. All Experiments may be Simulated using MATLAB and to be verified using related training kits.

1. Measurement of Bit Error Rate using Binary Data
2. Verification of minimum distance in Hamming code
3. Determination of output of Convolutional Encoder for a given sequence
4. Determination of output of Convolutional Decoder for a given sequence
5. Efficiency of DS Spread- Spectrum Technique
6. Simulation of Frequency Hopping (FH) system
7. Effect of Sampling and Quantization of Digital Image
8. Verification of Various Transforms (FT / DCT/ Walsh / Hadamard) on a given Image (Finding Transform and Inverse Transform)
9. Point, Line and Edge detection techniques using derivative operators.
10. Implementation of FIR filter using DSP Trainer Kit (C-Code/ Assembly code)
11. Implementation of IIR filter using DSP Trainer Kit (C-Code/ Assembly code)
12. Determination of Losses in Optical Fiber
13. Observing the Waveforms at various test points of a mobile phone using Mobile Phone Trainer
15. Study of ISDN Training System with Protocol Analyzer
16. Characteristics of LASER Diode
REFERENCE BOOKS:

5. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
SCHEME OF INSTRUCTION & EXAMINATION
(Regulation R17)

M.TECH (COMMUNICATION SYSTEMS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

(With effect from 2017-2018 Admitted Batch onwards)
Under Choice Based Credit System

III-SEMESTER

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Total  20  150   -  150

1. The Viva-Voce for the Comprehensive Viva-Voce and Seminar-I shall be held with the Project Guide, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.

2. Candidates can do their Project Work Part-I&II work within the department or in any industry/research organization for two semesters (i.e. 3rd and 4th semesters). In case of thesis done in an industry/research organization, one advisor (Guide) should be from the department and one advisor (Co-Guide) should be from the industry/research organization.

3. The Project Work Part-I should be submitted at the end of 3rd Semester and it will be evaluated through Review by a committee consisting of Head of the Department, PG coordinator and Project guide. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.
SCHEME OF INSTRUCTION & EXAMINATION  
(Regulation R17)

M.TECH (COMMUNICATION SYSTEMS)  
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING  

(With effect from 2017-2018 Admitted Batch onwards)  
Under Choice Based Credit System

IV-SEMESTER

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1. The viva-voce for Seminar-II shall be held with the Project Guide, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.

2. A publication of a paper on the thesis work in a National/International Journal at the end of 4th semester is mandatory for the submission of thesis work.

3. The Project Work Part-II should be submitted at the end of 4th semester and it will be evaluated through Viva–Voce examination by a committee consisting of External Examiner, Head of the Department, Project guide and PG coordinator. The marks shall be awarded in the ratio of 40, 20, 20 and 20 Marks by the members respectively.
# SCHEME OF INSTRUCTION & EXAMINATION

(Regulation R17)

M.TECH (POWER SYSTEM AND AUTOMATION)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
(With effect from 2017-2018 Admitted Batch onwards)
Under Choice Based Credit System

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ADVANCED POWER SYSTEM OPERATION AND CONTROL

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:
1. To study the effect of generation with limited energy supply.
2. To understand the economics of power system operation with thermal and hydro units.
3. To study the unit commitment problem for economic load dispatch.
4. To study the optimal power flow problem with solution.
5. To study the load frequency control of two area systems with and without control.
6. To study the effectiveness of interchange evaluation in interconnected power systems.

COURSE OUTCOMES:
After completion of this course the students will be able to:
1. Know the effect of generation with limited energy supply.
2. Develop generation dispatching scheme for thermal and hydro units.
3. Determine the unit commitment problem for economic load dispatch.
4. Get the knowledge of load frequency control of single area and two area systems with and without control.
5. Determine the interchange evaluation in interconnected power systems.

SYLLABUS

UNIT-I:

UNIT-II:
Unit commitment problem: Constraints in UCP,UC solutions. UC Methods-priority list method, Forward Dynamic programming Approach and Lagrange Relaxation method.

UNIT-III:
Optimal power flow: Solution of OPF, gradient method, Newton’s method, linear programming method with only real power variables, linear programming with AC power flow variables, security-constrained optimal power flow.
UNIT-IV:
Single area & Two areas Load Frequency Control: concept of single & two area Load frequency control: uncontrolled case and controlled case, tie-line bias control. Optimal two-area LF control-steady state representation, performance Index and optimal parameter adjustment.

UNIT-V:

TEXT BOOKS:
1. Power system operation and control PSR Murthy B.S publication.

REFERENCE BOOKS:
HVDS TRANSMISSION

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COURSE OBJECTIVES:
1. To learn various schemes of HVDC transmission.
2. To learn about the basic HVDC transmission equipment.
3. To learn the control of HVDC systems.
4. To be exposed to the interaction between HVAC and HVDC system.
5. To be exposed to the various protection schemes of HVDC engineering.

COURSE OUTCOMES:
After completion of this course the students will be able to:
1. Understand the various schemes of HVDC transmission.
2. Understand the basic HVDC transmission equipment.
3. Understand the control of HVDC systems.
4. Understand the interaction between HVAC and HVDC system.
5. Understand the various protection schemes of HVDC engineering.

SYLLABUS

UNIT-I:

UNIT-II:
Static Power Converters: 6-pulse bridge circuit and 12-pulse converters, converter station and Terminal equipment, commutation process, Rectifier and inverter operation, equivalent circuit for converter – special features of converter transformers. Comparison of the perform of diametrical connection with 6-pulse bridge circuit

UNIT-III:
Control of HVDC Converters and systems : constant current, constant extinction angle and constant Ignition angle control. Individual phase control and equidistant firing angle control, DC power flow control. Factors responsible for generation of Harmonics voltage and current harmonics effect of variation of $\alpha$ and $\mu$. Filters Harmonic elimination.
UNIT-IV:
Interaction between HV AC and DC systems – Voltage interaction, Harmonic instability problems and DC power modulation. Development of DC circuit Breakers, Multi-terminal DC links and systems; series, parallel and series parallel systems, their operation and control.

UNIT -V:
Transient over voltages in HV DC systems : Over voltages due to disturbances on DC side, over voltages due to DC and AC side line faults. Converter faults and protection in HVDC Systems: Converter faults, over current protection - valve group, and DC line protection, circuit breakers. Over voltage protection of converters, surge arresters.

TEXT BOOKS:

REFERENCE BOOKS:
REACTIVE POWER COMPENSATION & MANAGEMENT

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COURSE OBJECTIVES:
1. To know the basic objectives of reactive power compensation.
2. To know the types of compensation and their behavior.
3. To know the mathematical modeling of reactive power compensating devices.
4. To know the reactive power compensation has to be done at distribution side.
5. To know the role of reactive power compensation at electric traction systems and Arc furnaces.

COURSE OUTCOMES:
After completion of this course the students will be able to:
1. Learn various load compensations.
2. Obtain the mathematical model of reactive power compensating devices.
3. Get application of reactive power compensation in electrical traction & arc furnaces.

SYLLABUS

UNIT-I: Load Compensation
Objectives and specifications – reactive power characteristics – inductive and capacitive approximate biasing – Load compensator as a voltage regulator – phase balancing and power factor correction of unsymmetrical loads- examples.

UNIT-II: Reactive power compensation in transmission system:

UNIT-III: Reactive power coordination:
Objective – Mathematical modeling – Operation planning – transmission benefits – Basic concepts of quality of power supply – disturbances- steady-state variations – effects of under voltages – frequency – Harmonics, radio frequency and electromagnetic interferences
UNIT-IV: Distribution side Reactive power Management:

User side reactive power management:
KVAR requirements for domestic appliances – Purpose of using capacitors – selection of capacitors – deciding factors – types of available capacitor, characteristics and Limitations

UNIT-V: Reactive power management in electric traction systems and arc furnaces:
Typical layout of traction systems – reactive power control requirements – distribution transformers- Electric arc furnaces – basic operations- furnaces transformer – filter requirements – remedial measures – power factor of an arc furnace

TEXT BOOK:
1. Reactive power control in Electric power systems by T.J.E.Miller, John Wiley and sons, 1982

REFERENCE BOOK:
ANALYSIS OF POWER ELECTRONIC CONVERTERS

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COURSE OBJECTIVES:
1. To understand the control principle of ac to ac conversion with suitable power semiconductor devices.
2. To have the knowledge of ac to dc conversion and different ac to dc converter topologies.
3. To understand the effect of operation of controlled rectifiers on p.f. and improvement of p.f. with PFC converters.
4. To acquire the knowledge on dc-ac converters and to know the different control techniques of dc-ac converters.
5. To know multilevel inverter configuration to improve the quality of the inverter output voltage.

COURSE OUTCOMES:
After completion of this course the students will be able to:
1. Have the knowledge on principle of ac voltage controller and their control techniques.
2. Convert ac voltage to dc voltage and different control strategies of the converter.
3. Control the power factor of single phase and three phase ac to dc converters.
4. Understand the conversion of dc to ac and their control strategies.
5. Analyze different multilevel inverters to improve the quality of the output voltage of the inverter.

SYLLABUS

UNIT-I: AC voltage Controllers
Single Phase AC Voltage Controllers with RL and RLE loads-ac voltage controller’s with PWM control-Effects of source and load inductances –synchronous tap changers Application numerical problems Three Phase AC Voltage controllers-Analysis of Controllers with star and delta connected resistive, resistive –inductive loads-Effects of source and load inductances– Application numerical problems.

UNIT-II: AC-DC converters
UNIT-III: Power Factor Correction Converters
Single-phase single stage boost power factor corrected rectifier, power circuit principle of operation, and steady state- analysis, three phase boost PFC converter

UNIT-IV: PWM Inverters


TEXT BOOKS:
2. Modern power Electronics and AC Drives – B.K.Bose

REFERENCE BOOKS:
MODERN CONTROL THEORY
(ELECTIVE-I)

Lecture : 3 Periods                          Int.Marks : 30
Tutorial : 1 Period.                       Ext. Marks : 70
Exam     : 3 Hrs.                           Credits : 3

COURSE OBJECTIVES:
1. To facilitate the evolution of state variable approach for the analysis of control systems.
2. To examine the importance of controllability and observability in modern control engineering.
3. To enable students to analyze various types of nonlinearities & construction of trajectories using describing functions and phase plane analysis.
4. To study the analysis of stability and instability of continuous time invariant system.

COURSE OUTCOMES:
After completion of this course the students will be able to:
1. Understanding the state variable approach is suitable for higher order.
2. To analyze the concepts of controllability and observability.
3. To analyze the various non-linearities through describing functions and phase plane analysis.
4. Typical issues of stability and instability of continuous time invariant systems.

SYLLABUS

UNIT –I: State Variable Analysis

UNIT –II: State Variable Techniques
General concept of Controllability - General concept of Observability Controllability tests for Continuous &Time Invariant systems - Observability tests for Continuous &Time Invariant systems – Controllability and Observability of state model in Jordan Canonical form - Controllability and Observability Canonical forms of State model – State feedback controller design through pole assignment.

UNIT –III: Non Linear Systems – I
UNIT –IV: Non Linear Systems – II
Introduction to phase – plane analysis, Method of Isoclines for Constructing Trajectories, singular points, phase – plane analysis of nonlinear control systems.

UNIT –V: Stability Analysis

TEXT BOOKS:
1. Modern Control System Theory by M. Gopal – New Age International – 1984

REFERENCE BOOKS:
POWER SYSTEM SECURITY
(ELECTIVE-I)

Lecture : 3 Periods  Int.Marks : 30
Tutorial : 1 Period.  Ext. Marks : 70
Exam : 3 Hrs.  Credits : 3

COURSE OBJECTIVES:
1. To study the short circuit analysis of balanced and unbalanced power systems.
2. To study the power system security analysis.
3. To study the real time control of power system.
4. To study the principles and applications of SCADA.

COURSE OUTCOMES:
After completion of this course the students will be able to:
1. Analyze the balanced and unbalanced power system under short circuit conditions.
2. Understand how to minimize the short circuit effect on the power System.
3. Design the power system with more security with real time control.
4. Implant SCADA for power system security.

SYLLABUS

UNIT-I:
Short circuit analysis techniques in AC power Systems- Simulation of short circuit and open circuit faults using network theorems- fixed impedance short circuit analysis techniques time domain short circuit analysis in large scale power systems- analysis of time variation of AC and DC short circuit components

UNIT-II:
Fixed impedance Short circuit analysis of large scale power systems-general analysis of balanced, unbalanced and open circuit faults- 3-phase short circuit analysis in large scale power systems, Network equivalents and practical short circuit current assessments in large scale Ac power systems-general studies- uncertainties in short circuit current calculations-probabilistic Short circuit analysis

UNIT-III:
Risk assessment and safety considerations-control and limitation of high short circuit currents-limitation of short circuit currents in power system operation, design and planning, Types of short circuit fault current limiters- earthing resistor or reactor connected to transformer neutral-pyrotechnic fault current limiters- series resonant current limiters- saturable reactor limiters-other types of fault current limiters and their applications.
UNIT-IV:

UNIT-V:
Computer control power systems – need for real time and computer control of power systems- operating states of power system – SCADA- implementation considerations – software requirements for implementing above functions.

TEXT BOOKS:
1. Allen J. Wood and Bruce Woolenberg: Power System Generation, Operation and Control, John Willey and sons, 1996

REFERENCE BOOKS:
COURSE OBJECTIVES:

1. To learn essential optimization techniques for applying to day to day problems.
2. To study the optimization techniques for linear programming problems.
3. To understand the optimization techniques for Non-linear programming problems.

COURSE OUTCOMES:

1. After learning the techniques they can apply to engineering and other problems.

SYLLABUS

UNIT-I:

UNIT-II:
Classical Optimization Techniques: Introduction, Single variable optimization, Multivariate optimization with no constraints; Multivariable optimization with Equality constraints - Solution by Direct Substitution method, Method of Lagrangian multipliers; Multivariable optimization with inequality constraints: Kuhn-Tucker conditions.

UNIT-III:

UNIT-IV:
UNIT-V:
Non-Linear Programming-II: Constrained Optimization- Characteristics Of A Constrained Problem, Classification- Direct Methods, Indirect Methods- Interior Penalty Function Method, Exterior Penalty Function Method,

TEXT BOOKS:

REFERENCE BOOKS:
GENERATION & MEASUREMENTS OF HIGH VOLTAGES
(ELECTIVE-I)

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COURSE OBJECTIVES:
1. To study the numerical methods for analyzing electrostatic field problems.
2. To study the fundamental principles of generation of high voltage for testing.
3. To study the methods for measurement of high AC, DC and transient voltages.
4. To study the measurement techniques for high AC, DC and impulse currents.

COURSE OUTCOMES:
After completion of this course the students will be able to:
1. Understand numerical computation of electrostatic problems.
2. Understand the techniques of generation of high AC, DC and transient voltages.
3. Measure high AC, DC and transient voltages.
4. Measure high AC, DC and transient currents.

SYLLABUS

UNIT-I: Electrostatic fields and field stress control:

UNIT-II: Generation of High AC & DC Voltages:

UNIT-III: Generation of Impulse Voltages:
Impulse voltage specifications-Impulse generations circuits-Operation, construction and design of Impulse generators-Generation of switching and long duration impulses. Impulse Currents: Generation of High impulse currents and high current pulses.

UNIT-IV: Measurement of High AC & DC Voltages:
UNIT-V: Measurement of Peak Voltages:

TEXT BOOKS:


REFERENCE BOOKS:

RENEWABLE ENERGY SYSTEMS
(ELECTIVE-II)

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COURSE OBJECTIVES:
1. To familiarize students regarding World Energy Scenario and Power Generation.
2. To familiarize students with Features of Conventional and Renewable Generation.
3. To Gain knowledge on Power balance /Frequency control of Renewable energy system.
5. To familiarize students with Power System Economics and the Electricity Market.
6. To understand the future towards a Sustainable Electricity supply.

COURSE OUTCOMES:
1. Students will be able to understand the World Energy Generation and consumption Over the past and present;
2. Students will be able to outline the technologies that are used to harness the Energy from Conventional and Non-conventional Sources.
3. Students will be able to understand power governing, dynamic frequency control of large systems, Impact of Renewable generation on Frequency control
4. Students will be able to explain the Issues Regarding Renewable Energy System in Power System
5. Students will be able to outline the Power system economics and Electricity Market
6. Students will have vision towards sustainable supply systems in Future.

SYLLABUS

UNIT-I:

UNIT-II:

UNIT-III:
UNIT-IV:

UNIT-V:


TEXT BOOKS:

REFERENCE BOOKS:
### ADVANCED DIGITAL SIGNAL PROCESSING  
(ELECTIVE-II)

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### COURSE OBJECTIVES:
1. To have knowledge on structures of different digital filters.
2. To design digital filters with different techniques.
3. To understand the implementation aspects of digital filters.
4. To analyze the effect of finite word length in signal processing.
5. To understand power spectrum estimation techniques in signal processing.

### COURSE OUTCOMES:
After completion of this course the students will be able to:
1. Describe structure of digital filters.
2. Design digital filters with different techniques.
3. Understand the implementation aspects of signal processing algorithms.
4. Know the effect of finite word length in signal processing.
5. Analyze different power spectrum estimation techniques.

### SYLLABUS

#### UNIT-I: Digital Filter Structure
Block diagram representation- Equivalent Structures-FIR and IIR digital filter Structures All pass Filters-tunable IIR Digital Filters-IIR tapped cascaded Lattice Structures-FIR cascaded Lattice structures-Parallel-Digital Sine-cosine generator-Computational complexity of digital filter structures.

#### UNIT-II: Digital filter design
Preliminary considerations-Bilinear transformation method of IIR filter design-design of Low pass high pass-Band pass, and Band stop- IIR digital filters-Spectral transformations of IIR filters, FIR filter design-based on Windowed Fourier series- design of FIR digital filters with least –mean- Square-error-constrained Least-square design of FIR digital filters

#### UNIT-III: DSP algorithm implementation
Computation of the discrete Fourier transform- Number representation-Arithmetic operations handling of overflow-Tunable digital filters-function approximation.
UNIT-IV: Analysis of finite Word length effects
The Quantization process and errors- Quantization of fixed -point and floating -point Numbers-
Analysis of coefficient Quantization effects - Analysis of Arithmetic Round-off errors, Dynamic
range scaling-signal- to- noise ratio in Low -order IIR filters-Low-Sensitivity Digital filters-
Reduction of Product round-off errors using error feedback-Limit cycles in IIR digital filters-
Round-off errors in FFT Algorithms.

UNIT V: Power Spectrum Estimation
Estimation of spectra from Finite Duration Observations signals – Non-parametric methods for
power spectrum Estimation – parametric method for power spectrum Estimation, Estimation of
spectral form-Finite duration observation of signals-Non-parametric methods for power spectrum
estimation-Walsh methods-Blackman & torchy method.

TEXT BOOKS:
   1st edition-9th reprint.
   reprint-2001

REFERENCE BOOKS:
4. Digital Filter Analysis and Design-Auntonian-TMH
COURSE OBJECTIVES:
1. Will be able to get the basic understanding of network modelling and reliability.
3. Reliability analysis of generation systems.
4. Decomposition techniques.

Course Outcomes:
After completion of this course the students will be able to:
1. Understand reliability analysis applied to power systems.
2. Understand Markov Chains and application to power systems.
3. Perform stability analysis of generation systems.
4. Understand decomposition techniques applied to power system.

SYLLABUS

UNIT-I :

UNIT-II :
Network Modelling and Reliability Analysis of Series, Parallel, Series-Parallel networks – complex networks – decomposition method Reliability functions F(t), F(t), R(t), h(t) and their relationship – exponential distributions – Expected value and standard deviation of exponential distribution – Bath tub curve – reliability analysis of series parallel networks using exponential distribution – reliability measures MTTF, MTTR, MTBF

UNIT-III :
UNIT-IV:

UNIT-V:
Composite system reliability analysis decomposition method – distribution system reliability analysis – radial networks – weather effects on transmission lines – Evaluation of load and energy indices.

TEXT BOOKS:

REFERENCE BOOKS:
ELECTRICAL DISTRIBUTION SYSTEMS
(ELECTIVE-II)

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COURSE OBJECTIVES:
1. To learn the importance of economic distribution of electrical energy.
2. To analyze the distribution networks for V-drops, P_Loss calculations and reactive power.
3. To understand the co-ordination of protection devices.
4. To impart knowledge of capacitive compensation/voltage control.
5. To understand the principles of voltage control.

COURSE OUTCOMES:
After completion of this course the students will be able to:
1. Analyze a distribution system.
2. Design equipment for compensation of losses in the distribution system.
3. Design protective systems and co-ordinate the devices.
4. Get understanding of capacitive compensation.
5. Get understanding of voltage control.

SYLLABUS

UNIT-I: Distribution System Basics:
Brief description about electrical power transmission and distribution systems, Different types of distribution sub-transmission systems, Substation bus schemes, Factors effecting the substation location, Factors effecting the primary feeder rating, types of primary feeders, Factors affecting the primary feeder voltage level, Factors affecting the primary feeder loading.

UNIT-II: Distribution System Loads:
Various types of loads, Definitions of various terms related to system loading, Detailed description of distribution transformer loading, feeder loading, Modelling of star and delta connected loads, two-phase and single-phase loads, shunt capacitors.

UNIT-III: Substations and feeders:
Rating of a distribution substation for square and hexagonal shaped distribution substation service area, Derivation of K constant, Radial feeder with uniformly and non-uniformly distributed loading.
UNIT-IV: Distribution System Load Flow:
Exact line segment model, Modified line model, approximate line segment model, Review of the two-winding transformer theory, two-winding auto transformer, Step-Voltage Regulators, Line drop compensator, Forward/Backward sweep distribution load flow algorithm.

UNIT-V: Voltage Drop and Power loss Calculation:
Detailed analysis of non-three phase primary lines, concepts of four-wire multi-grounded common-neutral distribution system, Percent power loss calculation, Distribution feeder cost calculation methods, Capacitor installation types, types of three-phase capacitor-bank connections, Economic justification for capacitors.


TEXT BOOKS:

REFERENCE BOOKS:
SIMULATION LABORATORY

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COURSE OBJECTIVES:
1. To practice the basic theories of Electrical Power system.
2. To provide hands-on experience to the students, so that they are able to apply theoretical concepts in practice.
3. To use computer simulation tools such as MATLAB to carry out design experiments as it is a key analysis tool of engineering design.
4. To give a specific design problem to the students, which after completion they will verify using the simulation software or hardware implementation.
5. To understand the modeling of various aspects of Power System analysis and develop the MATLAB programming.

COURSE OUTCOMES:
1. After the completion of the lab they will verify the theoretical concepts of various aspects of Power System analysis.
2. Graduate will demonstrate the ability to identify, formulate and solve Power System engineering problems.
3. Graduate will demonstrate the ability to design and conduct experiments, analyze and interpret data.
4. Graduates will demonstrate the ability to design a electrical systems or process as per needs and specifications.
5. Graduate will demonstrate the skills to use modern engineering tools, software’s and equipment to analyze problem.

SYLLABUS

LIST OF EXPERIMENTS:
2. Load Flow Solution Using Gauss Siedel Method
3. Load Flow Solution Using Newton Raphson Method
4. Load Flow Solution Using Fast Decoupled Method
5. Formation of Z-Bus by Z-bus building algorithm
6. Symmetrical Fault analysis using Z-bus
7. Unsymmetrical Fault analysis using Z-bus
8. Economic Load Dispatch with & without transmission losses
9. Transient Stability Analysis Using Point By Point Method
10. Load Frequency Control of Single Area Control& Two Area Control system with and without controllers.

**REFERENCE BOOKS:**

4. *Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers” by Rudra Pratap, Oxford University Press, 2010*
SCHEME OF INSTRUCTION & EXAMINATION  
(Regulation R17)  

M.TECH (POWER SYSTEM AND AUTOMATION)  
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING  

(With effect from 2017-2018 Admitted Batch onwards)  
Under Choice Based Credit System  

II-SEMESTER  

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<td>M17PS1210 High Voltage Testing Techniques</td>
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<td>M17PS1211 Power System Transients</td>
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<td>M17PS1212 Voltage Stability</td>
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COURSE OBJECTIVES:
1. To study the model of synchronous machines.
2. To study the stability studies of synchronous machines.
3. To study the solution method of transient stability.
4. To study the effect of different excitation systems.

COURSE OUTCOMES:
After completion of this course the students will be able to:
1. Able to determine the model of synchronous machines.
2. Able to know the stability studies of synchronous machines.
3. Able to get the knowledge of solution methods of transient stability.
4. Able to know the effect of different excitation systems in power systems.

SYLLABUS

UNIT-I:
System Dynamics : Synchronous machine model in state space from computer representation for excitation and governor system – modeling of loads and induction machines.

UNIT-II:

UNIT-III:

UNIT-IV:
Effect of governor action and excite on power system stability effect of saturation, saliency & automatic voltage regulators on stability.
UNIT-V:
Excitation Systems: Rotating Self-excited Exciter with direct acting Rheostatic type voltage regulator – Rotating main and Pilot Exciters with Indirect Acting Rheostatic Type Voltage Regulator – Rotating Main Exciter, Rotating Amplifier and Static Voltage Regulator – Static excitation scheme – Brushless excitation system.

TEXT BOOKS:

3. Power systems stability and control by PRABHA KUNDUR, TMH.

REFERENCE BOOKS:

REAL TIME CONTROL OF POWER SYSTEMS

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

COURSE OBJECTIVES:
1. To understand the importance of state estimation in power systems.
2. To know the importance of security and contingency analysis.
3. To understand SCADA, its objectives and its importance in power systems.
4. To know the significance of voltage stability analysis.
5. To know the applications of AI to power systems problems.

COURSE OUTCOMES:
After completion of this course the students will be able to:
1. Understand state estimation, security and contingency evaluation.
2. Understand about Supervisory control and data acquisition.
3. Real time software application to state estimation.
4. Understand application of AI in power system.

SYLLABUS

UNIT-I:
State Estimation : Different types of State Estimations, Theory of WLS state estimation, sequential and non-sequential methods to process measurements. Bad data Observability, Bad data detection, identification and elimination.

UNIT-II:

UNIT-III:
Computer Control of Power Systems : Need for real time and computer control of power systems, operating states of a power system, SCADA - Supervisory control and Data Acquisition systems implementation considerations, energy control centres, software requirements for implementing the above functions.

UNIT-IV:
UNIT-V:
Application of AI and ANN in Power System : Basic concepts and definitions, algorithms for load flow, short term load forecasting, fault diagnosis and state estimation.

TEXT BOOKS:

REFERENCE BOOKS:
ARTIFICIAL INTELLIGENCE TECHNIQUES

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COURSE OBJECTIVES:
1. To have knowledge on concept of neural network.
2. To know different types of neural networks and training algorithms.
3. To understand the concept of genetic algorithm and its application in optimization.
4. To have the knowledge on fuzzy logic and design of fuzzy logic controllers.
5. To know the applications of AI Techniques in electrical engineering.

COURSE OUTCOMES:
After completion of this course the students will be able to:
3. Develop algorithms using genetic algorithm for optimization.
4. Analyze and design fuzzy logic systems.
5. Apply AI Techniques in electrical engineering.

SYLLABUS

UNIT-I: Introduction to Neural Networks
Introduction, Humans and Computers, Biological Neural Networks, Historical development of neural network, Terminology and Topology, Biological and artificial neuron models, Basic learning laws.

UNIT-II: Feed Forward Neural Networks
Introduction, Perceptron models: Discrete, continuous and multi-category, Training algorithms: Discrete and Continuous Perceptron Networks, Perceptron convergence theorem, Limitations and applications of the Perceptron model, Generalized delta learning rule, Feed forward recall and error back propagation training-Radial basis function algorithms-Hope field networks.

UNIT-III: Genetic algorithms & Modelling
Introduction-encoding-fitness function-reproduction operators-genetic operators-cross over and mutation-generational cycle-convergence of genetic algorithm

UNIT-IV: Classical and Fuzzy Sets
Introduction to classical sets - properties, operations and relations; Fuzzy sets, membership, Uncertainty, operations, properties, fuzzy relations, cardinalities, membership functions. Fuzzy Logic System Components-Fuzzification, Membership value assignment, development of rule base and decision making system, defuzzification to crisp sets, defuzzification methods.
UNIT-V: Application of AI Techniques - load forecasting-load flow studies-economic load dispatch-load frequency control-reactive power control-speed control of dc and ac motors

TEXT BOOKS:
1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by RajasekharanandPai – PHI Publication.

REFERENCE BOOKS:
FLEXIBLE AC TRANSMISSION SYSTEMS

Lecture : 3 Periods  Int.Marks : 30
Tutorial : 1 Period. Ext. Marks : 70
Exam : 3 Hrs. Credits : 3

COURSE OBJECTIVES:
1. To study the performance improvements of transmission system with FACTS.
2. To study the effect of static shunt compensation.
3. To study the effect of static series compensation.
4. To study the effect of UPFC.

COURSE OUTCOMES:
After completion of the course, the student will be able to:
1. Know the performance improvement of transmission system with FACTS.
2. Get the knowledge of effect of static shunt and series compensation.
3. Know the effect of UPFC.
4. Determine an appropriate FACTS device for different types of applications.

SYLLABUS

UNIT-I:
FACTS concepts, Transmission interconnections, power flow in an AC System, loading capability limits, Dynamic stability considerations, importance of controllable parameters, basic types of FACTS controllers, benefits from FACTS controllers.

UNIT-II:
Basic concept of voltage and current source converters, comparison of current source converters with voltage source converters. Static shunt compensation : Objectives of shunt compensation, midpoint voltage regulation, voltage instability prevention, improvement of transient stability, Power oscillation damping, methods of controllable var generation, variable impedance type static var generators, switching converter type var generators, hybrid var generators.

UNIT-III:
SVC and STATCOM : The regulation and slope transfer function and dynamic performance, transient stability enhancement and power oscillation damping, operating point control and summary of compensation control.

UNIT-IV:
Static series compensators : Concept of series capacitive compensation, improvement of transient stability, power oscillation damping, functional requirements. GTO thyristor controlled series capacitor (GSC), thyristor switched series capacitor (TSSC), and thyristor controlled series capacitor (TCSC), control schemes for GSC, TSSC and TCSC.
UNIT-V:
Unified Power Flow Controller: Basic operating principle, conventional transmission control capabilities, independent real and reactive power flow control, comparison of the UPFC to series compensators and phase angle regulators.

TEXT BOOKS:

REFERENCE BOOKS:
2. HVDC & FACTS Controllers: applications of static converters in power systems- Vijay K.Sood- Springer publishers
SMART GRID TECHNOLOGIES
(ELECTIVE-III)

Lecture: 3 Periods
Tutorial: 1 Period.
Exam: 3 Hrs.

Int. Marks: 30
Ext. Marks: 70
Credits: 3

COURSE OBJECTIVES:
1. To understand concept of smart grid and developments on smart grid.
2. To understand smart grid technologies and application of smart grid concept in hybrid electric vehicles etc.
3. To have knowledge on smart substations, feeder automation and application for monitoring and protection.
4. To have knowledge on micro grids and distributed energy systems.
5. To know power quality aspects in smart grid.

COURSE OUTCOMES:
After completion of this course the students will be able to:
1. Understand smart grids and analyse the smart grid policies and developments in smart grids.
2. Develop concepts of smart grid technologies in hybrid electrical vehicles etc.
3. Understand smart substations, feeder automation, GIS etc.
4. Analyse micro grids and distributed generation systems.
5. Analyse the effect of power quality in smart grid and to understand latest developments in ICT for smart grid.

SYLLABUS

UNIT-I:
Introduction to Smart Grid: Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient &Self Healing Grid, Present development & International policies on Smart Grid. Case study of Smart Grid.

UNIT-II:
Smart Grid Technologies: Part 1: Introduction to Smart Meters, Real Time Prizing, Smart Appliances, Automatic Meter Reading(AMR), Outage Management System(OMS), Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation, Phase Shifting Transformers.

UNIT-III:
Smart Grid Technologies: Part 2: Smart Substations, Substation Automation, Feeder Automation, Geographic Information System(GIS), Intelligent Electronic Devices(IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System(WAMS), Phase Measurement Unit(PMU).
UNIT-IV:
**Microgrids and Distributed Energy Resources:** Concept of micro grid, need & applications of microgrid, formation of microgrid, Issues of interconnection, protection & control of microgrid. Plastic & Organic solar cells, Thin film solar cells, Variable speed wind generators, fuelcells, microturbines, Captive power plants, Integration of renewable energy sources.

UNIT-V:

**Information and Communication Technology for Smart Grid:** Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighborhood Area Network (NAN), Wide Area Network (WAN).

TEXT BOOKS:

REFERENCE BOOKS:
COURSE OBJECTIVES:

1. To understand significance of power quality and power quality parameters.
2. To know types of transient over voltages and protection of transient voltages.
3. To understand harmonics, their effects, harmonic indices and harmonic minimization techniques.
4. To understand long duration voltage variation and flicker.
5. To know power quality aspects in distributed generation.

COURSE OUTCOMES:

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

1. Have the knowledge on causes of power quality, power quality parameters.
2. Understand sources of transient over voltages and providing protection to transient over voltages.
3. Understand effects of harmonics, sources of harmonics and harmonic minimization.
4. Analyze long duration voltage variations and regulation of voltage variations.
5. Describe power quality aspects in distributed generation and develop solutions to wiring and grounding problems.

SYLLABUS

UNIT-I: Introduction

UNIT-II: Transient Over Voltages
UNIT-III: Harmonic Distortion and solutions

UNIT-IV: Long Duration Voltage Variations
Principles of Regulating the Voltage - Device for Voltage Regulation - Utility Voltage Regulator Application - Capacitor for Voltage Regulation - End-user Capacitor Application – Regulating Utility Voltage with Distributed Resources – Flicker

UNIT-V: Distributed Generation and Power Quality

TEXT BOOKS:

REFERENCE BOOKS:
6. Power Quality in Power systems and Electrical Machines-EwaldF.fuchs, Mohammad A.S. Masoum-Elsevier
### COURSE OBJECTIVES:
1. To learn about classification and operation of static relays.
2. To understand the basic principles and application of comparators.
3. To learn about static version of different types of relays.
4. To understand about numerical protection techniques.

### COURSE OUTCOMES:
After completion of this course the students will be able to:
1. Know the classifications and applications of static relays.
2. Understand the application of comparators.
3. Understand the static version of different types of relays.
4. Understand the numerical protection techniques.

### SYLLABUS

**UNIT-I:**

**UNIT-II:**

**UNIT-III:**
Static over current (OC) relays – Instantaneous, Definite time, Inverse time OC Relays, static distance relays, static directional relays, static differential relays, measurement of sequence impedances in distance relays, multi input comparators, elliptic & hyperbolic characteristics, switched distance schemes, Impedance characteristics during Faults and Power Swings,
UNIT-IV:

UNIT-V:

TEXT BOOKS:
1. Power System Protection with Static Relays – by TSM Rao, TMH.
2. Power system protection & switchgear by Badri Ram & D N viswakarma, TMH.

REFERENCE BOOKS:
1. Protective Relaying Vol-II Warrington, Springer.
3. Electrical Power System Protection –C.Christopoulos and A.Wright- Springer
4. Protection & Switchgear –BhaveshBhalaja,R.PMaheshwari, NileshG.Chothani-Oxford publisher
EHVAC TRANSMISSION
(ELECTIVE-III)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:
1. To calculate the transmission line parameters.
2. To calculate the field effects on EHV and UHV AC lines.
3. To have knowledge of corona, RI and audible noise in EHV and UHV lines.
4. To have knowledge of voltage control and compensation problems in EHV and UHV transmission systems.

COURSE OUTCOMES:
After completion of this course the students will be able to:
1. Calculate the transmission line parameters.
2. Calculate the field effects on EHV and UHV AC lines.
3. Determine the corona, RI and audible noise in EHV and UHV lines.
4. Analyze voltage control and compensation problems in EHV and UHV transmission systems.

SYLLABUS

UNIT-I:

UNIT-II:
Calculation of electro static field of AC lines - Effect of high electrostatic field on biological organisms and human beings. Surface voltage Gradient on conductors, surface gradient on two conductor bundle and cosine law, maximum surface voltage gradient of bundle with more than 3 sub conductors, Mangolt formula.

UNIT-III:
Corona : Corona in EHV lines – corona loss formulae – attenuation of traveling waves due to corona – Audio noise due to corona, its generation, characteristics and limits, measurement of audio noise.
UNIT-IV:
Power Frequency voltage control: Problems at power frequency, generalized constants, No load voltage conditions and charging currents, voltage control using synchronous condenser, cascade connection of components: Shunt and series compensation, sub synchronous resonance in series – capacitor compensated lines

UNIT-V:
Static reactive compensating systems: Introduction, SVC schemes, Harmonics injected into network by TCR, design of filters for suppressing harmonics injected into the system.

TEXT BOOKS:

REFERENCE BOOKS:
POWER SYSTEM DEREGULATION
(ELECTIVE-IV)

COURSE OBJECTIVES:
1. To provide in-depth understanding of operation of deregulated electricity market systems.
2. To examine typical issues in electricity markets and how these are handled world–wide in various markets.
3. To enable students to analyze various types of electricity market operational and control issues using new mathematical models.

COURSE OUTCOMES:
After completion of this course the students will be able to:
1. Understand of operation of deregulated electricity market systems
2. Typical issues in electricity markets
3. To analyze various types of electricity market operational and control issues using new mathematical models.

SYLLABUS

UNIT-I:

UNIT-II:
Electricity sector structures and Ownership /management, the forms of Ownership and management. Different structure model like Monopoly model, Purchasing agency model, wholesale competition model, Retail competition model.

UNIT-III:
Framework and methods for the analysis of Bilateral and pool markets, LMP based markets, auction models and price formation, price based unit commitment, country practices.

UNIT-IV:
Transmission network and market power. Power wheeling transactions and marginal costing, transmission costing. Congestion management methods- market splitting, counter-trading; Effect of congestion on LMPs- country practices.
UNIT-V:

TEXT BOOKS:

REFERENCE BOOKS:
1. Market operations in electric power systems - M. Shahidehpour, H. Yamin and Z. Li, Wiley.
HIGH VOLTAGE TESTING TECHNIQUES
(ELECTIVE-IV)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:
1. To understand non destructive testing methods.
2. To understand commercial and technical testing of different HV power applications.

COURSE OUTCOMES:
After completion of this course the students will be able to:
1. Understand different testing procedures on electrical
   a) Insulating materials
   b) Insulation Systems.
   c) Power apparatus.
2. Learn the different testing techniques adopted on electrical power apparatus

SYLLABUS

UNIT-I:
Non Destructive Testing Techniques : Measurement of DC Resistivity – Dielectric loss and
dielectric constant of insulating materials – Schering bridge method – Transformer ratio arm
bridge for high voltage and high current applications – null detectors.

UNIT-II:
High Voltage Testing of Power Apparatus : Need for testing standards – Standards for
porcelain/Glass insulators-Classification of porcelain/glass insulator tests – Tests for cap and pin
porcelain/Glass insulators.

UNIT-III:
High voltage AC testing methods-Power frequency tests-Over voltage tests on insulators,
Isolators, Circuit Breakers and power cables. Artificial Contamination Tests : Contamination
flashover phenomena-Contamination Severity-Artificial contamination tests-Laboratory Testing
versus in-Service Performance-Case study.

UNIT-IV:
Impulse Testing : Impulse testing of transformers, insulators, Surge diverters, Bushings, cables,
circuit breakers.
UNIT-V:
Partial Discharge Measurement : PD equivalent model-PD currents-PD measuring circuits-
Straight and balanced detectors-Location and estimation of PD in power apparatus-PD
measurement by non electrical methods-Calibration of PD detectors. RIV Measurements : Radio
Interference – RIV – Measurement of RI and RIV in laboratories and in field. Different test
arrangements and their limitations.

TEXT BOOKS:
   1984.

REFERENCE BOOKS:
2. Hyltencavallius. N. High voltage laboratory planning EnileHaefely&Co. Ltd. Based
   Switzerland 1988
3. Ryan H.M. and Whiskand: design and operation perspective of British UHV Lab IEE pre 133
   H.V. Testing Techniques Halfly.
POWER SYSTEM TRANSIENTS
(ELECTIVE-IV)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int. Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:
1. To study the effect of over voltages on power system.
2. To study the techniques of travelling wave on transmission lines.
3. To study the effect of lightning and switching transients on power systems.

COURSE OUTCOMES:
After completion of this course the students will be able to:
1. Understand the severity of over voltages due to faults on a given power system.
2. To limit the effects of lightning over voltages in power systems.
3. Understand the various transient over voltages and their effects on power system.

SYLLABUS

UNIT-I:
Basic Concepts and Simple Switching Transients:- Switching an LR,LC,RLC circuits
Transients Analysis of Three-Phase power Systems: – Symmetrical components in three-phase
Systems, Sequence Components for Unbalanced Network Impedances, the Sequence Networks,
analysis of Unsymmetrical Three-Phase Faults-single line-to-Ground Fault, Three phase to
ground fault.

UNIT-II:
Travelling Waves:- Velocity of Travelling waves and Characteristic Impedance, Energy
Contents of Travelling Waves, Attenuation and Distortion of Electromagnetic Waves, telegraph
equations-lossless line, distortion less line, Reflection and Refraction of Travelling Waves,
Reflection of Travelling Waves against Transformer-and-Generator-windings, the Origin
Transient Recovery voltages, bewley-lattice diagram. travelling waves and multi conductor
system.

UNIT-III:
Switching Transients:- arc interruption in circuit breaker, transient recovery voltage, arc-circuit
interaction, interruption of capacitive currents, interruption of inverse currents, interruption of
fault current in transmission line and transformers.
UNIT-IV:

UNIT-V:
Lightning –Induced Transients:- Mechanism of Lightning, wave shape of the lightning current, Direct lighting Stroke to transmission line towers, direct lightening stroke to a line, lightning protection scheme. Numerical simulation of electrical transients, The Electromagnetic Transient Program, principles of numerical techniques used in transient simulation.

TEXT BOOKS:
2. Power system grounding & transients by A.P. Sakis Meliopolous.
3. Bewley LV “travelling waves on transmission system” Dover publications Inc.,

REFERENCE BOOKS:
1. “Transients in power systems” by Lou Van Sluis
VOLTAGE STABILITY
(ELECTIVE-IV)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

COURSE OBJECTIVES:
1. To study the importance of voltage stability.
2. To study the various load modelling in power system.
3. To study the effect of reactive power compensation and voltage control.
4. To study the modelling of voltage stability static indices.
5. To study the voltage stability margin and its improvement.

COURSE OUTCOMES:
After completion of this course the students will be able to:
1. Know the importance of voltage stability.
2. Determine the load modelling of power systems.
3. Get the knowledge of reactive power compensation and voltage control.
4. Determine the modelling of static voltage stability indices.
5. Know the voltage stability margin and its improvement.

SYLLABUS

UNIT-I:
Reactive Power flow and voltage stability in power systems: Physical relationship indicating dependency of voltage on reactive power flow - reactive power, transient stability; Q V curve; definition of voltage stability, voltage collapse and voltage security. Voltage collapse phenomenon, Factors of voltage collapse, effects of voltage collapse, voltage collapse analysis.

UNIT-II:
Power system loads: Load characteristics that influence voltage stability such as – Discharge lighting, Induction motor, Air conditioning and heat pumps, Electronic power supplies, Over Head lines and cables.

UNIT-III:
UNIT-IV:
Voltage stability static indices: Development of voltage collapse index – power flow studies – singular value decomposition – minimum singular value of voltage collapse – condition number as voltage collapse index.

UNIT-V:

TEXT BOOKS:

REFERENCE BOOKS:
COURSE OBJECTIVES:

1. To understand the experimental determination of various parameters used in power system area.
2. To analyse the performance of transmission line with and without compensation.

COURSE OUTCOMES:

1. After the Completion of lab they will understand procedure for determination of various parameters used in power system as well as performance of transmission line.

SYLLABUS

List of Experiments:

1. Determination of Sequence Impedence of an Alternator by direct method.
2. Determination of Sequence impedance of an Alternator by fault Analysis.
   (a). by application of sequence voltage.
   (b). using fault analysis
5. Poly-phase connection on three single phase transformers and measurement of phase displacement.
7. Measurement of ABCD parameters on transmission line model.
9. Study of Ferranti effect in long transmission line.
REFERENCE BOOKS:

4. Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers” by Rudra Pratap, Oxford University Press, 2010
SCHEME OF INSTRUCTION & EXAMINATION
(Regulation R17)

M.TECH (POWER SYSTEM AND AUTOMATION)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

(With effect from 2017-2018 Admitted Batch onwards)
Under Choice Based Credit System

III-SEMESTER

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1. The Viva-Voce for the Comprehensive Viva-Voce and Seminar-I shall be held with the Project Guide, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.

2. Candidates can do their Project Work Part-I&II work within the department or in any industry/research organization for two semesters (i.e. 3rd and 4th semesters). In case of thesis done in an industry/research organization, one advisor (Guide) should be from the department and one advisor (Co-Guide) should be from the industry/research organization.

3. The Project Work Part-I should be submitted at the end of 3rd Semester and it will be evaluated through Review by a committee consisting of Head of the Department, PG coordinator and Project guide. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.
SCHEME OF INSTRUCTION & EXAMINATION
(Regulation R17)

M.TECH (POWER SYSTEM AND AUTOMATION)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

(With effect from 2017-2018 Admitted Batch onwards)
Under Choice Based Credit System

IV-SEMESTER

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1. The viva-voce for Seminar-II shall be held with the Project Guide, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.

2. A publication of a paper on the thesis work in a National/International Journal at the end of 4th semester is mandatory for the submission of thesis work.

3. The Project Work Part-II should be submitted at the end of 4th semester and it will be evaluated through Viva–Voce examination by a committee consisting of External Examiner, Head of the Department, Project guide and PG coordinator. The marks shall be awarded in the ratio of 40, 20, 20 and 20 Marks by the members respectively.
SCHEME OF INSTRUCTION & EXAMINATION
(Regulation R17)

M.TECH (INFORMATION TECHNOLOGY)
DEPARTMENT OF INFORMATION TECHNOLOGY
(With effect from 2017-2018 Admitted Batch onwards)
Under Choice Based Credit System

I-SEMESTER

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UNIVERSITY OF SARGODHA

ADVANCED DATA STRUCTURES

Lecture : 3 Periods  Int.Marks : 30
Tutorial : 1 Period.  Ext. Marks : 70
Exam : 3 Hrs.  Credits : 3

COURSE OBJECTIVES:

1. An advanced data structures course considering practical and analytical aspects.
2. This is a lecture course presenting techniques and evaluation tools and a laboratory course
   with programming assignments emphasizing efficient implementation methodologies.

COURSE OUTCOMES:

At the end of the course the student will be able to
1. Basic ability to analyze algorithms and to determine algorithm correctness and time
   efficiency class.
2. Master a variety of advanced abstract data type (ADT) and data structures and their
   implementations.
3. Master different algorithm design techniques.
4. Ability to apply and implement learned algorithm design techniques and data structures to
   solve problems.

SYLLABUS

UNIT I:
Introduction to Data Structures, Singly Linked Lists, Doubly Linked Lists, Circular Lists-

UNIT II:
Introduction to Data Structures, Singly Linked Lists, Doubly Linked Lists, Circular Lists-

UNIT III:
Dictionaries, ADT, The List ADT, Stack ADT, Queue ADT, Hash Table Representation,

UNIT IV:
Priority queues-Definition, ADT, Realising a Priority Queue Using Heaps, Definition,

Code: M17 IT 1101
UNIT V:

TEXT BOOKS:

2. Data Structures, Algorithms and Applications in java, 2/e, Sartaj Sahni, University Press.

REFERENCES BOOKS:

1. Data Structures and Algorithm Analysis, 2/e, Mark Allen Weiss, Pearson.
DISTRIBUTED SYSTEMS

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COURSE OBJECTIVES:

1. This course provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission.
2. The structure of distributed systems using multiple levels of software is emphasized. Specific topics include:
   - distributed algorithms
   - distributed file systems
   - distributed databases,
   - security and protection
   - examples of research and commercial distributed systems

COURSE OUTCOMES:

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

1. Explain various architectures used to design distributed systems, such as client-server and peer-to-peer.
2. Build distributed systems using various inter-process communication techniques, such as remote method invocation, remote events, and tuple spaces.
3. Build distributed systems using various techniques for tolerating partial failures, such as leasing and replication.
4. Build distributed systems using various inter process coordination techniques, such as distributed mutual exclusion, distributed monitors, and tuple spaces.
5. Explain various distributed algorithms, such as logical clocks and leader election.
6. Analyze and explain current distributed systems research literature.

SYLLABUS

UNIT-I:

UNIT-II:
Inter-process Communication: Introduction, The API for the Internet Protocols- The Characteristics of Inter-process communication, Sockets, UDP Datagram Communication, TCP Stream Communication; External Data Representation and Marshalling; Client Server Communication; Group Communication-IP Multicast- an implementation of group communication, Reliability and Ordering of Multicast.

UNIT-III:
Distributed Objects and Remote Invocation: Introduction, Communication between Distributed Objects-Object Model, Distributed Object Modal, Design Issues for RMI, Implementation of RMI, Distributed Garbage Collection; Remote Procedure Call, Events and Notifications, Case Study: JAVA RMI

UNIT-IV:

UNIT-V:

Transactions & Replications: Introduction, System Model and Group Communication, Concurrency Control in Distributed Transactions, Distributed Dead Locks, Transaction Recovery; Replication-Introduction, Passive (Primary) Replication, Active Replication.

TEXT BOOKS:

REFERENCES BOOKS:
1. “Distributed Operating Systems” By Andrew S Tanenbaum, Pearson Publication
SOFTWARE REQUIREMENTS AND ESTIMATION

Lecture : 3 Periods  Int.Marks : 30
Tutorial : 1 Period  Ext. Marks : 70
Exam : 3 Hrs.  Credits : 3

COURSE OBJECTIVES:
The main objective of the course is to expose the students to Software requirements and estimation. Upon completion of this course, the student will be able to:
1. Understand the good practices for requirements engineering.
2. Understand requirements elicitation techniques,
3. Understand analysis models, Software quality attributes.
4. Understand software size estimation,
5. Understand Effort, Schedule and Cost Estimation.

COURSE OUTCOMES:
At the end of the course the student will be able to
1. Understand what software engineering is and why it is important.
2. Understand the concept of software processes and software process models.
3. Understand the principles of object orientation.
4. Understand the principle of software development on reusable technology.
5. Understand the type of software requirements (Functional & Non Functional).
6. Understand that the effective requirements management can be accomplished only by an effective software team.

SYLLABUS

UNIT I:
Software Requirements: What and Why
Essential Software requirement, Good practices for requirements engineering, Improving requirements processes, Software requirements and risk management

UNIT II:
Software Requirements Engineering : Requirements elicitation, requirements analysis documentation, review, elicitation techniques, analysis models, Software quality attributes, risk reduction through prototyping, setting requirements priorities, verifying requirements quality Software Requirements Modeling: Use Case Modeling, Analysis Models, Dataflow diagram, state transition diagram, class diagrams, Object analysis, Problem Frames

UNIT III:
Software Requirements Management : Requirements management Principles and practices, Requirements attributes, Change Management Process, Requirements Traceability Matrix, Links in requirements chain
Requirements Management Tools: Benefits of using a requirements management tool, commercial requirements management tool, Rational Requisite pro, Caliber – RM, implementing requirements management automation
UNIT IV:
Software Estimation: Components of Software Estimations, Estimation methods, Problems associated with estimation, Key project factors that influence estimation.
Size Estimation: Two views of sizing, Function Point Analysis, Mark II FPA, Full Function Points, LOC Estimation, Conversion between size measures,

UNIT V:

TEXT BOOKS:

1. Software Requirements and Estimation by Rajesh Naik and Swapna Kishore, Tata Mc Graw Hill

REFERENCE BOOKS:

1. Software Requirements by Karl E. Weigers, Microsoft Press.
DATAMINING AND KNOWLEDGE DISCOVERY

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COURSE OBJECTIVES:

1. We understand Data Mining (Knowledge Discovery) as a life-cycle process from data to information and insights.
2. In times of Big data, Data Mining has become a central interest both for industry and academia.
3. In this course, we discuss several data-related aspects like preprocessing or privacy as well as selected aspects of Machine Learning.
4. An expansive definition of Data Mining, which is the derivation of insights from masses of data by studying and understanding the structure of the constituent data, and selected applications complete the course.

COURSE OUTCOMES:

At the end of the course the student will be able to
1. Explain the fundamental concepts of Data mining & Knowledge discovery.
2. Understand the data preprocessing techniques.
3. Understand Machine Learning algorithms and strategies to discovery and to deploy the discovered results.
4. Argue the importance of domain knowledge during the data analysis.

SYLLABUS

UNIT I:
Introduction to Data mining, types of Data, Data Quality, Data Processing, Measures of Similarity and Dissimilarity, Exploring Data: Data Set, Summary Statistics, Visualization, OLAP and multi dimensional data analysis.

UNIT II: Classification: Basic Concepts, Decision Trees and model evaluation: General approach for solving a classification problem, Decision Tree induction, Model over fitting: due to presence of noise, due to lack of representation samples, Evaluating the performance of classifier. Nearest Neighborhood classifier, Bayesian Classifier, Support vector Machines: Linear SVM, Separable and Non Separable case.

UNIT III: Association Analysis: Problem Definition, Frequent Item-set generation, rule generation, compact representation of frequent item sets, FP-Growth Algorithms. Handling Categorical, Continuous attributes, Concept hierarchy, Sequential, Sub graph patterns

UNIT IV: Clustering: Over view, K-means, Agglomerative Hierarchical clustering, DBSCAN, Cluster evaluation: overview, Unsupervised Cluster Evaluation using cohesion and separation, using proximity matrix, Scalable Clustering algorithm

TEXT BOOKS:

1. Introduction to Data Mining: Pang-Ning tan, Michael Steinbach, Vipinkumar, Addision-Wesley.
2. Introduction to Data Mining with Case Studies: GK Gupta; Prentice Hall.

REFERENCE BOOKS:

2. Fundamentals of data warehouses, 2/e, Jarke, Lenzerini, Vassiliou, Vassiliadis, Springer.
4. Data Mining, Concepts and Techniques, 2/e, Jiawei Han, MichelineKamber, Elsevier, 2006.
Code: M17 IT 1105

ADVANCED COMPUTER NETWORKS

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COURSE OBJECTIVES:

The objective of this course unit is twofold:
1. To study the problematic of service integration in TCP/IP networks focusing on protocol design, implementation and performance issues.
2. To debate the current trends and leading research in the computer networking area.

COURSE OUTCOMES:

At the end of the course the student will be able to
In general terms, the proposed UCT is envisioned to deliver the following learning outcomes:
1. To identify and discuss the concepts underlying IPv6 protocol, and their main characteristics and functionality;
2. To understand the principles and functionality of mobile IP, explaining its concretization in IPv6; to understand the needs of optimization of the mobility mechanisms and description of some extensions that aim to reduce handover latency and requirements from terminals;
3. To recognize the need for service integration and discuss how it can be accomplished;
4. To explain and exemplify current QoS architectures and mechanisms, and the QoS support challenges in future networks;

SYLLABUS

UNIT-I:
Network layer: Network Layer design issues: store-and forward packet switching, services provided transport layers, implementation connection less services, implementation connection oriented services, comparison of virtual –circuit and datagram subnets.

UNIT-II:
IPV4 Address address space, notations, classful addressing, classless addressing network addressing translation(NAT) , IPV6 Address structure address space, Internetworking need for network layer internet as a data gram, internet as connection less network.
IPV4 datagram, Fragmentation, checksum, options.
IPV6 Advantages, packet format, extension Headers, Transition form IPV4 to IPV6
UNIT–III:
Process to process delivery: client/server paradigm, multiplexing and demultiplexing connectionless versus connection oriented services, reliable versus reliable.

UDP: well known ports for UDP, user data gram, check sum, UDP operation, and uses of UDP
TCP: TCP services, TCP features, segment, A TCP connection, Flow control, error control, congestion control.
SCTP: SCTP services SCTP features, packet format, An SCTP association, flow control, error control.
Congestion control: open loop congestion control, closed loop congestion control, Congestion control in TCP, frame relay,
QUALITY OF SERVICE: flow characteristics, flow classes TECHNIQUES TO IMPROVE QOS: scheduling, traffic shaping, resource reservation, admission control.

UNIT –IV:
Multimedia: introduction digital a audio , Audio compression, streaming audio, internet radio, voice over IP, introduction to video, video compression, video on demand, the MBone-the multicast back bone

UNIT –V: Emerging trends Computer Networks:
Wireless sensors networks: WSN functioning, operation system support in sensor devices, WSN Characteristics, sensor network operation, sensor Architecture: cluster management;
Wireless mesh networks WMN design, Issues in WMNs;

TEXT BOOKS:
1. Data communications and networking 4th edition, Behrouz A Fourzan, TMH
3. Computer networks, Mayank Dave, CENGAGE

REFERENCE BOOKS:
WEB TECHNOLOGIES

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVE:

On completion of this course, a student will be familiar with client server architecture and able to develop a web application using PHP. Students will gain the skills and project-based experience in web application and development.

COURSE OUTCOMES:

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

1. Develop a dynamic webpage by the use of java script and DHTML.
2. Write a well formed / valid XML document.
3. Connect to database and perform data manipulations.
4. Write programs in PERL.
5. Develop Ruby applications.

SYLLABUS

UNIT-I:
Java script : The Basic of Java script: Objects, Primitives Operations and Expressions, Screen Output and Keyboard Input, Control Statements, Object Creation and Modification, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions

UNIT-II:
XML: Document type Definition, XML schemas, Document object model, SLT, DOM and SAX Approaches, AJAX A New Approach: Introduction to AJAX, Integrating PHP and AJAX.

UNIT-III:
PHP Programming: Introducing PHP: Creating PHP script, Running PHP script. Working with variables and constants: Using variables, Using constants, Data types, Operators. Controlling program flow: Conditional statements, Control statements, Arrays, functions. Working with forms and Databases such as MySQL.

UNIT-IV:
PERL: Introduction to PERL, Operators and if statements, Program design and control structures, Arrays, Hashs and File handling, Regular expressions, Subroutines, Retrieving documents from the web with Perl.
UNIT-V:

TEXT BOOKS:
2. Web Technologies, Uttam K Roy, Oxford

REFERENCE BOOKS:
1. Ruby on Rails Up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006)
COURSE OBJECTIVE:

The main objective of this course is to do practice on computer networks programming, data mining tools and data structure programming.

COURSE OUTCOMES:

At the end of the laboratory the student will be able to

1. Student able to execute programmes in computer networks
2. Student able to know use of different data mining tools
3. Student able to execute programmes on data structures

SYLLABUS

1. Write a c program to implement one to one chat application using sockets?
2. Write a c program to implement redundancy check using CRC?
3. Write a java program to implement simulation of sliding window protocol?
4. Write a java program to get the MAC or Physical address of the system using Address Resolution Protocol?
5. By using Data mining tool Demonstration of preprocessing on dataset student.arff?
6. By using Data mining tool Demonstration of classification rule process on dataset employee.arff using j48 algorithm
7. By using Data mining tool Demonstration of Association rule process on dataset test.arff using apriori algorithm?
8. By using Data mining tool Demonstration of classification rule process on dataset employee.arff using naïve baye’s algorithm?
10. To perform various Recursive & Non-Recursive operations on Binary Search Tree
11. To implement BFS & DFS for a Graph
12. To implement Merge & Heap Sort of given elements
13. To perform various operations on AVL trees.
14. To implement Krushkal’s algorithm to generate a min-cost spanning tree
15. To implement Prim’s algorithm to generate a min-cost spanning tree
16. To implement functions of Dictionary using Hashing

TEXT BOOKS:

2. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, PEA.
REFERENCE BOOKS:

1. Cryptography and Network Security, 2/e, Kahate, TMH.
2. Introduction to Data Mining with Case Studies, GK Gupta, Prentice Hall.
**SCHEME OF INSTRUCTION & EXAMINATION**  
(Regulation R17)  

**M.TECH (INFORMATION TECHNOLOGY)**  
**DEPARTMENT OF INFORMATION TECHNOLOGY**  

(With effect from 2017-2018 Admitted Batch onwards)  
Under Choice Based Credit System  

**II-SEMESTER**

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ADVANCED UNIX PROGRAMMING

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:
1. To understand the fundamental design of the unix operating system
2. To become fluent with the systems calls provided in the unix environment
3. To be able to design and build an application/service over the unix operating system.
4. To learn the characteristics of an object-oriented programming language:
5. To learn the basic principles of object-oriented design and software engineering in terms of software reuse and managing complexity.
6. To enhance problem solving and programming skills in C++ with extensive programming projects.
7. To become familiar with the UNIX software development environment.

COURSE OUTCOMES:
1. Able to understand and reason out the working of Unix Systems
2. Able to build an application/service over a Unix system.
3. Describe the architecture and features of UNIX Operating System and distinguish it from other Operating System Understanding.
4. Demonstrate UNIX commands for file handling and process control Applying.
5. Write Regular expressions for pattern matching and apply them to various filters for a specific task applying.
6. Analyze a given problem and apply requisite facets of SHELL programming in order to devise a SHELL script to solve the problem

SYLLABUS

UNIT-I
Introduction to unix-Brief History-What is Unix-Unix Components-Using Unix-Commands in Unix-Some Basic Commands-Command Substitution-Giving Multiple Commands.

UNIT-II

UNIT-III
UNIT-IV
Filters-The Grep Family-Other Filters-The Stream Editor Sed-The AWK Pattern Scanning and processing Language-Good Files and Good Filters.

UNIT-V

TEXT BOOKS:
1. The Unix programming Environment by Brain W. Kernighan & Rob Pike, Pearson.
2. Introduction to Unix Shell Programming by M.G.Venkateshmurthy, Pearson.

REFERENCE BOOKS:
1. Unix and shell programming by B.M. Harwani, OXFORD university press.
Cyber Security

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

Course Objectives:
1. This Course focuses towards the introduction of Cyber security using various cryptographic algorithms and understanding Cyber security applications.
2. It also focuses on the practical applications that have been implemented and are in use to provide email and web security.

Course Outcomes:
1. Will have knowledge and understanding of: Classical encryption techniques, Block ciphers and the Data Encryption Standard Key management, Public key cryptosystems, Message authentication, Hash functions and algorithms.
3. Will develop their skills in: The programming of symmetric and/or asymmetric ciphers and their use in the networks.

Syllabus

Unit I:
Introduction: Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

Unit II:
Conventional Encryption: Conventional Encryption Principles, Conventional encryption algorithms, cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC.

Unit III:
UNIT IV:
Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET)
Email Privacy: Pretty Good Privacy (PGP) and S/MIME.

UNIT V:
Intrusion Detection: Intruders, Intrusion Detection systems, Password Management.
Malicious Software: Viruses and related threats & Countermeasures.
Fire walls: Firewall Design principles, Trusted Systems.

TEXT BOOKS:
2. Hack Proofing your Network, Russell, Kaminsky, Forest Puppy, Wiley Dreamtech

REFERENCE BOOKS:
COURSE OBJECTIVES:

1. Introduce students the concept and challenge of big data (3 V’s: volume, velocity, and variety).
2. Teach students in applying skills and tools to manage and analyze the big data

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

1. Understand the concept and challenge of big data and why existing technology is inadequate to analyze the big data.
2. Collect, manage, store, query, and analyze various form of big data.
3. Gain hands-on experience on large-scale analytics tools to solve some open big data problems.
4. Understand the impact of big data for business decisions and strategy.

SYLLABUS

UNIT-I
Data structures in Java: Linked List, Stacks, Queues, Sets, Maps; Generics: Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization

UNIT-II

UNIT-III
Writing MapReduce Programs: A Weather Dataset, Understanding Hadoop API for MapReduce Framework (Old and New), Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, Record Reader, Combiner, Partitioner

UNIT-IV
UNIT-V
Pig: Hadoop Programming Made Easier Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data

TEXT BOOKS:
3. Hadoop in Action by *Chuck Lam, MANNING Publ.*
4. Hadoop for Dummies by *Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk, Bruce Brown, Rafael Coss*

REFERENCE BOOKS:
1. Hadoop in Practice by *Alex Holmes, MANNING Publ.*
2. Hadoop MapReduce Cookbook, *Srinath Perera, Thilina Gunarathne*

SOFTWARE LINKS:
2. Hive: [https://cwiki.apache.org/confluence/display/Hive/Home](https://cwiki.apache.org/confluence/display/Hive/Home)
3. Piglatin: [http://pig.apache.org/docs/r0.7.0/tutorial.html](http://pig.apache.org/docs/r0.7.0/tutorial.html)
COURSE OBJECTIVE:
The student will learn about the cloud environment, building software systems and components that scale to millions of users in modern internet, cloud concepts capabilities across the various cloud service models including IaaS, PaaS, SaaS, and developing cloud based software applications on top of cloud platforms.

COURSE OUTCOMES:
At the end of the course, the students will be able to
1. Understanding the key dimensions of the challenge of Cloud Computing
2. Assessment of the economics, financial, and technological implications for selecting cloud computing for own organization
3. Assessing the financial, technological, and organizational capacity of employer’s for actively initiating and installing cloud-based applications.
4. Assessment of own organizations’ needs for capacity building and training in cloud computing-related IT areas

SYLLABUS

UNIT I:
Introduction: Network centric computing, Network centric content, peer-to-peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing
Parallel and Distributed Systems: introduction, architecture, distributed systems, communication protocols, logical clocks, message delivery rules, concurrency, and model concurrency with Petri Nets.

UNIT II:
Cloud Infrastructure: At Amazon, The Google Perspective, Microsoft Windows Azure, Open Source Software Platforms, Cloud storage diversity, Inter cloud, energy use and ecological impact, responsibility sharing, user experience, Software licensing
Cloud Computing: Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, The Map Reduce Program model, HPC on cloud, biological research

UNIT III:
Cloud Resource virtualization: Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization-full and para, performance and security isolation, hardware support for virtualization, Case Study: Xen, vBlades Cloud Resource Management and Scheduling: Policies and Mechanisms, Applications of control theory to task scheduling, Stability of a two-level resource allocation architecture, feed back control based on dynamic thresholds, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines, Scheduling Map Reduce applications, Resource management and dynamic application scaling
UNIT IV:
Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems, Google file system, Apache Hadoop, Big Table, Megastore (Text book 1), Amazon Simple Storage Service (S3) (Text book 2).
Cloud Security: Cloud security risks, security – atop concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks

UNIT V:
Google: Google App Engine, Google Web Toolkit (Text Book 2).
Microsoft: Azure Services Platform, Windows live, Exchange Online, Share Point Services, Microsoft Dynamics CRM (Text Book 2).

TEXT BOOKS:
1. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier

REFERENCE BOOK:
ADHOC & SENSOR NETWORKS  
(ELECTIVE-I)

Lecture : 3 Periods  
Tutorial : 1 Period.  
Exam : 3 Hrs.  
Int.Marks : 30  
Ext. Marks : 70  
Credits : 3

COURSE OBJECTIVES:
1. The course objective is to identify the major issues associated with ad-hoc/sensor networks.
2. Students will explore current ad-hoc/sensor technologies by researching key areas such as algorithms, protocols, hardware, and applications.
3. Students will learn how to program and communicate with embedded operating system such as TinyOS, a prominent application development environment for sensor systems using Motes.

COURSE OUTCOMES:
At the end of the course, the students will be able to
1. Students will be able to describe the unique issues in ad-hoc/sensor networks. This will be accessed through assignments and labs.
2. Students will be able to describe current technology trends for the implementation and deployment of wireless ad-hoc/sensor networks. This will be assessed through assignments, and classroom interaction.
3. Students will be able to discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc/sensor networks. This will be assessed through assignments, labs, and classroom interaction.
4. Students will be able to build and configure a testbed for a sensor network. This will be assessed through labs.
5. Students will be able to describe and implement protocols on a sensor test bed network. This will be assessed through assignments, labs, and classroom interaction.

SYLLABUS

UNIT I:  
Introduction to Ad Hoc Wireless Networks  
Cellular and Ad Hoc Wireless Networks, Characteristics of MANETs, Applications of MANETs, Issues and Challenges of MANETs, Ad Hoc Wireless Internet, MAC protocols for Ad hoc Wireless Networks-Issues, Design Goals and Classifications of the MAC Protocols

UNIT II:  
Routing Protocols for Ad Hoc Wireless Networks  
UNIT III:
Security protocols for Ad hoc Wireless Networks

UNIT IV:
Basics of Wireless Sensors and Applications
The Mica Mote, Sensing and Communication Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications, Data Retrieval in Sensor Networks-Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

UNIT V:
Security in WSNs
Security in WSNs, Key Management in WSNs, Secure Data Aggregation in WSNs, Sensor Network Hardware-Components of Sensor Mote, Sensor Network Operating Systems–TinyOS, LA-TinyOS, SOS, RETOS, Imperative Language-nesC, Dataflow style language: Tiny GALS, Node-Level Simulators, NS-2 and its sensor network extension, TOSSIM.

TEXT BOOKS:

REFERENCE BOOKS:
SEMANTIC WEB SERVICES
(ELECTIVE-I)

Lecture: 3 Periods
Tutorial: 1 Period
Exam: 3 Hrs.

Int.Marks: 30
Ext. Marks: 70
Credits: 3

COURSE OBJECTIVE:

1. Subject Knowledge Aims The aim of this course is to teach the students the concepts, technologies and techniques underlying and making up the Semantic Web.
2. Understand and discuss fundamental concepts, advantages and limits of the semantic web;
3. Understand and use ontology in the context of Computer Science and the semantic web; use the RDF framework and associated technologies such as RDFa;
4. Understand the relationship between Semantic Web and Web 2.0.
5. Methods Lectures, tutorials and practical sessions together with course notes, recommended reading, worksheets and some additional handouts. Assessment Assessed coursework.

COURSE OUTCOMES:

At the end of the course, the students will be able to
1. Understand the rationale behind Semantic Web.
3. Design RDF Schemas for ontologies.
5. Query ontologies using SPARQL.
6. Understand and reflect on the principles of Ontology Engineering.
7. Make an association between Semantic web and Web 2.0.
8. Apply Semantic web technologies to real world applications.

SYLLABUS

UNIT I:

UNIT II:

UNIT III:
UNIT IV:
Semantic Web Applications, Services and Technology: Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base, XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods,

UNIT V:
Social Network Analysis and semantic web: What is social Networks analysis, development of the social networks analysis, Electronic Sources for Network Analysis – Electronic Discussion networks, Blogs and Online Communities, Web Based Networks. Building Semantic Web Applications with social network features.

TEXT BOOKS:

REFERENCE BOOKS:
COURSE OBJECTIVES:

To introduce the
1. Major programming paradigms, and the principles and techniques involved in design and implementation of modern programming languages.
2. Notations to describe syntax and semantics of programming languages.
3. Concepts of ADT and object oriented programming for large scale software development.
4. Concepts of concurrency control and exception handling.

COURSE OUTCOMES:

At the end of the course, the students will be able to
1. Understand the fundamental principles underlying various programming languages features
2. Understand the basic algorithms in implementing simple programming languages
3. Understand some principles in the design of programming languages

SYLLABUS

UNIT I:
Syntax and semantics: Evolution of programming languages, describing syntax, context, free grammars, attribute grammars, describing semantics, lexical analysis, parsing, recursive - decent bottom - up parsing

UNIT II:
Data, data types, and basic statements: Names, variables, binding, type checking, scope, scope rules, lifetime and garbage collection, primitive data types, strings, array types, associative arrays, record types, union types, pointers and references, Arithmetic expressions, overloaded operators, type conversions, relational and boolean expressions , assignment statements , mixed mode assignments, control structures – selection, iterations, branching, guarded Statements

UNIT III:
Subprograms and implementations: Subprograms, design issues, local referencing, parameter passing, overloaded methods, generic methods, design issues for functions, semantics of call and return, implementing simple subprograms, stack and dynamic local variables, nested subprograms, blocks, dynamic scoping

UNIT IV:
Object-orientation, concurrency, and event handling: Object – orientation, design issues for OOP languages, implementation of object, oriented constructs, concurrency, semaphores, Monitors, message passing, threads, statement level concurrency, exception handling, event handling
UNIT V:
Functional programming languages: Introduction to lambda calculus, fundamentals of functional programming languages, Programming with Scheme, – Programming with ML, Logic programming languages: Introduction to logic and logic programming, –Programming with Prolog, multi - paradigm languages

TEXT BOOKS:

REFERENCE BOOKS:
INTERNET OF THINGS
(ELECTIVE-I)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:

1. Assess the vision and introduction of IoT.
2. Understand IoT Market perspective.
3. Implement Data and Knowledge Management and use of Devices in IoT Technology.
5. Classify Real World IoT Design Constraints, Industrial Automation in IoT.

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

1. Interpret the vision of IoT from a global context.
2. Determine the Market perspective of IoT.
3. Compare and Contrast the use of Devices, Gateways and Data Management in IoT.
4. Implement state of the art architecture in IoT.
5. Illustrate the application of IoT in Industrial Automation and identify Real World Design constraints.

SYLLABUS

UNIT I:
The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples OF IoTs, Design Principles For Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

UNIT II:
Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT III:

UNIT IV:
UNIT V:

TEXTBOOKS:
1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education

REFERENCE BOOKS:
1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things CunoPfister, Oreilly.
MACHINE LEARNING  
(ELECTIVE-II) 

Lecture : 3 Periods  
Tutorial : 1 Period.  
Exam : 3 Hrs.  

Int.Marks : 30  
Ext. Marks : 70  
Credits : 3

COURSE OBJECTIVES:

1. Introduce students to the basic concepts and techniques of Machine Learning.  
2. Develop skills of using recent machine learning software for solving practical problems.  
3. Gain experience of doing independent study and research.  
4. Gain experience for predicting the future values by known information.

COURSE OUTCOMES:

At the end of the course, the students will be able to  
1. Develop an appreciation for what is involved in learning from data  
2. Understand a wide variety of learning algorithms  
3. Understand how to apply a variety of learning algorithms to data.  
4. Understand how to perform evaluation of learning algorithms and model selection.

SYLLABUS

UNIT -I:  
The ingredients of machine learning, Tasks: the problems that can be solved with machine learning, Models: the output of machine learning, Features, the workhorses of machine learning. Binary classification and related tasks: Classification, Scoring and ranking, Class probability estimation

UNIT-II:  
Beyond binary classification: Handling more than two classes, Regression, Unsupervised and descriptive learning. Concept learning: The hypothesis space, Paths through the hypothesis space, Beyond conjunctive concepts

UNIT-III:  
Tree models: Decision trees, Ranking and probability estimation trees, Tree learning as variance reduction. Rule models: Learning ordered rule lists, Learning unordered rule sets, Descriptive rule learning, First-order rule learning

UNIT -IV:  
UNIT-V:

TEXT BOOKS:
2. Machine Learning, *Tom M. Mitchell, MGH.*

REFERENCE BOOKS:
1. Understanding Machine Learning: From Theory to Algorithms, *Shai Shalev-Shwartz, Shai Ben David, Cambridge.*
COURSE OBJECTIVES:

1. Become familiar with difference between Information retrieval and data Base Management Systems
2. To learn different indexing techniques to apply data Base systems
3. To understand various searching techniques to retrieve data from databases and ware houses.
4. To understand various methods for compression of files.

COURSE OUTCOMES:

At the end of the course, the students will be able to
1. Identify Data Base Management systems and data ware houses
2. Use knowledge of data structures and indexing methods in information retrieval Systems
3. Choose clustering and searching techniques for different data base systems

SYLLABUS

UNIT I:
Introduction to Information storage and retrieval systems: Domain Analysis of IR systems, IR and other types of Information Systems, IR System Evaluation Introduction to Data structures and algorithms related to Information Retrieval: Basic Concepts, Data structures, Algorithms.

UNIT II:
Inverted Files and Signature Files: Introduction, Structures used in Inverted Files, Building an Inverted file using a sorted array, Modifications to the Basic Techniques.Signature Files: Concepts of Signature files, Compression, Vertical Partitioning, Horizontal Partitioning.

UNIT III:

UNIT IV:
Stemming Algorithms and Thesaurus Construction: Types of Stemming algorithms, Experimental Evaluations of Stemming, Stemming to Compress Inverted Files. Thesaurus Construction: Features of Thesauri, Thesaurus Construction, Thesaurus construction from Texts, Merging existing Thesauri.
UNIT V:

TEXT BOOKS:

REFERENCE BOOKS
2. Information Retrieval Data Structures and Algorithms, Frakes, Ricardo Baeza-Yates, PEA.
3. Information Storage and Retrieval, Robert Korfhage, John Wiley &amp; Sons.
4. Introduction to Information Retrieval, Manning, Raghavan, Cambridge University Press.
COURSE OBJECTIVES:
1. The objective of this course is Provide knowledge of models, methods and tools used to solve regression, classification, feature selection and density estimation problems.
2. Provide knowledge of learning and adaptation in supervised modes of learning
3. Provide knowledge of recognition, decision making and statistical learning problems.
4. Provide knowledge of current research topics and issues in Pattern Recognition and Machine Learning

COURSE OUTCOMES:
At the end of the course, the students will be able to
1. Identify areas where Pattern Recognition and Machine Learning can offer a solution
2. Describe the strength and limitations of some techniques used in computational Machine Learning for classification, regression and density estimation problems
3. Describe genetic algorithms, validation methods and sampling techniques
4. Describe some discriminative, generative and kernel based techniques

SYLLABUS

UNIT I:
Pattern Recognition: machine perception, pattern recognition example, pattern recognition systems, the design cycle, learning and adaptation. Bayesian Decision Theory: Introduction, continuous features-two categories classifications, minimum error rate classification-zero-one loss function, classifiers, discriminate functions, and decision surfaces.

UNIT II:
Normal density: Univariate and multivariate density, discriminate functions for the normal density-different cases, Bayes decision theory – discrete features, compound Bayesian decision theory and context.
Component analyses: Principal component analysis, non-linear component analysis, Low dimensional representations, and multi dimensional scaling.

UNIT III:
Digitized Image and its properties: Basic concepts, Image Functions, the dirac distribution and convolution, the Fourier transform, Images as a Stochastic process, Images as linear systems.
Image Digitization: Sampling, Quantization, Colour Images.
UNIT IV:
Data Structures for Image Analysis: Levels of Image Data representation, traditional Image Data Structures- Matrices, Chains, Topological Data Structures, Relational Structures.

UNIT V:

TEXT BOOKS:

REFERENCE BOOK:
1. Digital Image Processing And Analysis – Chanda & Majumder
SOFTWARE TESTING METHODOLOGIES
(ELECTIVE-II)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:

1. To discuss various software testing issues and solutions in software unit test; integration, regression, and system testing.
2. To learn how to planning a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.
3. To expose the advanced software testing topics, such as object-oriented software testing methods, and component-based software testing issues, challenges, and solutions.
4. To gain software testing experience by applying software testing knowledge and methods to practice oriented software testing projects.
5. To understand software test automation problems and solutions.
6. To learn how to write software testing documents, and communicate with engineers in various forms. To gain the techniques and skills on how to use modern software testing tools to support software testing projects.

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

1. Understand the myths and facts of software testing. Analyze and design test cases using black box testing technique which includes decision tables domain testing and transition testing.
2. Analyze and design test cases for a white box testing technique which includes path testing, data flow graphs and matrix representation for a given problem.
3. Compute the path product and construct Regular Expression which is used to identify the alternate paths from source node to destination node for any application.
4. Execute how to run test script wizard and Execute how to do performance testing using testing tools including Winrunner and JMeter respectively.
5. Demonstrate the importance of testing and its role in need of software development.

SYLLABUS

UNIT-I:
Introduction: Purpose of Testing, Dichotomies, Model for Testing, Consequences of Bugs, Taxonomy of Bugs.

UNIT-II:
UNIT-III:

UNIT-IV:
Logic Based Testing: Overview, Decision Tables, Path Expressions, KV Charts, and Specifications.
Graph Matrices and Application:-Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm.

UNIT – V:

TEXT BOOKS:
2. Software Testing-Yogesh Singh, Camebridge

REFERENCE BOOKS:
1. The Craft of software testing -Brian Marick, Pearson Education.
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**COURSE OBJECTIVE:**
The main objective of this course is to do practice on UNIX Programming, Shell Script, java Programming

**COURSE OUTCOMES:**
At the end of the laboratory the student will be able to

1. Student able to execute programmes in UNIX
2. Student able to execute programmes on JAVA
3. Student able to execute programmes on Network programming

**SYLLABUS**

1. Write a Program to count the number of words and lines supplied at standard input using UNIX shell programming?
2. Write a shell script to find the factorial of a number entered through keyboard?
3. Write a shell script to find the gross salary given that if the basic salary is less than 1500 then HRA =10% of basic salary and DA=90% if the basic salary is greater than or equal to 1500 then HRA=500 and DA=98% of basic salary. The employee’s basic salary is the input through keyboard?
4. Write a shell script to display following information using case statement?
   a) List users
   b) Show date
   c) Display file
   d) Change working directory
   e) Return to original directory
   f) Quit
5. Write a c program to implement one to one chat application using sockets?
6. Write a c program to implement redundancy check using CRC?
7. Write a java program to implement simulation of sliding window protocol?
8. Write a java program to get the MAC or Physical address of the system using Address Resolution Protocol?
9. Write a java program to implement Play Fair Cipher to encrypt and decrypt a given message?
10. Write a java program to demonstrate public-key based asymmetric algorithms for encryption-based security of information?
11. Write a java program that implement secured Internet Protocol (IP) communications by using Internet Protocol Security (IPSec)?
12. Write a java program to implement RSA algorithm?
REFERENCE BOOKS:

2. Practical UNIX and Internet Security, 2/e, Simson Garfinkel, Gene Spafford, O'Reilly.
3. Cryptography and Network Security, 2/e, Kahate, TMH.
4. Advanced Programming in the UNIX Environment, Stevens, PEA/PHI.
SCHEME OF INSTRUCTION & EXAMINATION
(Regulation R17)

M.TECH (INFORMATION TECHNOLOGY)
DEPARTMENT OF INFORMATION TECHNOLOGY

(With effect from 2017-2018 Admitted Batch onwards)
Under Choice Based Credit System

III-SEMESTER

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1. The Viva-Voce for the Comprehensive Viva-Voce and Seminar-I shall be held with the Project Guide, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.

2. Candidates can do their Project Work Part-I&II work within the department or in any industry/research organization for two semesters (i.e. 3rd and 4th semesters). In case of thesis done in an industry/research organization, one advisor (Guide) should be from the department and one advisor (Co-Guide) should be from the industry/research organization.

3. The Project Work Part-I should be submitted at the end of 3rd Semester and it will be evaluated through Review by a committee consisting of Head of the Department, PG coordinator and Project guide. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.
SCHEME OF INSTRUCTION & EXAMINATION  
(Regulation R17)

M.TECH (INFORMATION TECHNOLOGY)  
DEPARTMENT OF INFORMATION TECHNOLOGY  
(With effect from 2017-2018 Admitted Batch onwards)  
Under Choice Based Credit System

IV-SEMESTER

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Total

1. The viva-voce for Seminar-II shall be held with the Project Guide, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.

2. A publication of a paper on the thesis work in a National/International Journal at the end of 4th semester is mandatory for the submission of thesis work.

3. The Project Work Part-II should be submitted at the end of 4th semester and it will be evaluated through Viva–Voce examination by a committee consisting of External Examiner, Head of the Department, Project guide and PG coordinator. The marks shall be awarded in the ratio of 40, 20, 20 and 20 Marks by the members respectively.
SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)
(Affiliated to JNTUK, Kakinada). (Recognised by AICTE, New Delhi)
Accredited by NAAC with ‘A’ Grade
Recognised as Scientific and Industrial Research Organisation
CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G Dt., A.P., INDIA :: PIN: 534 204

SCHEME OF INSTRUCTION & EXAMINATION
(Regulation R17)

M.TECH (CAD/CAM)

DEPARTMENT OF MECHANICAL ENGINEERING

(With effect from 2017-2018 Admitted Batch onwards)
Under Choice Based Credit System

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Course Code  | Course                                           |
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M17 CAD 1106 | Theory of Elasticity & Plasticity               |
M17 CAD 1107 | Nano Technology                                  |
M17 CAD 1108 | Design for Manufacturing & Assembly              |
M17 CAD 1109 | Mechatronics                                     |
M17 CAD 1110 | Computer Aided Process Planning                  |
### COURSE OBJECTIVE:

1. To familiarize the students with anatomy, kinematics, sensors and dynamics of a programmable machine of a robot.

### COURSE OUTCOMES:

Students will be able to

1. Distinguish between fixed automation and programmable automation.
2. Identify various components of robot.
3. Select appropriate type of actuator for a joint.
4. Illustrate robot applications in manufacturing.
5. Analyze kinematics of a robot.
6. Derive equations of motion of a manipulator for a particular application.

### SYLLABUS

**UNIT - I**

**INTRODUCTION:** Automation and Robotics, Robot anatomy, robot configuration, motions joint notation scheme, work volume, robot drive systems, control systems and dynamic performance, precision of movement.

**CONTROL SYSTEM AND COMPONENTS:** basic concepts and motion controllers, control system analysis, robot actuation and feedback components, Positions sensors, velocity sensors, actuators, power transmission systems, robot joint control design.

**UNIT - II**

**MOTION ANALYSIS AND CONTROL:** Manipulator kinematics, position representation, forward and inverse transformations, homogeneous transformations, manipulator path control, robot arm dynamics, configuration of a robot controller.

**UNIT - III**

**END EFFECTORS:** Grippers-types, operation, mechanism, force analysis, tools as end effectors consideration in gripper selection and design. SENSORS: Desirable features, tactile, proximity and range sensors, uses sensors in robotics.

**MACHINE VISION:** Functions, Sensing and Digitizing-imaging devices, Lighting techniques, Analog to digital single conversion, image storage: Image processing and Analysis-image data reduction, Segmentation, feature extraction, Object recognition. Training the vision system, Robotic application.
UNIT - IV
ROBOT PROGRAMMING: Lead through programming, Robot program as a path in space, Motion interpolation, WAIT, SIGNAL AND DELAY commands, Branching, capabilities and Limitations of lead through methods.
ROBOT LANGUAGES: Textual robot Languages, Generations of robot programming languages, Robot language structures, Elements and function.

UNIT - V
ROBOT CELL DESIGN AND CONTROL: Robot cell layouts-Robot centered cell, In-line robot cell, Considerations in work design, Work and control, Inter locks, Error detection, Work cell controller.
ROBOT APPLICATION: Material transfer, Machine loading/unloading, Processing operation, Assembly and Inspection, Future Application.

TEXT BOOKS:
1. Industrial Robotics /Groover M P /Pearson Edu.

REFERENCE BOOKS:
3. Robot Analysis and Intelligence / Asada and Slotine / Wiley Inter-Science.
6. Robotics and Control / Mittal R K & Nagrah I J / TMH.
COMPUTER AIDED MANUFACTURING

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:

1. To understand the importance of NC and CNC technology in manufacturing industry.
2. To understand the application of CAD/CAM systems in generating Part Programmes, in particular for complex models.
3. To understand and apply the use of various transducers, Micro controllers encoders and feedback devices.
4. To understand the importance of computer Aided Process Planning in CAM.

COURSE OUTCOMES:

Students will be able to
1. Understand the principles of Numerical Control (NC) technology and describe the range of machine tools to which it is applied.
2. Outline the various routs for part programming in NC and CNC.
3. Explain the application of CNC for Machining & Turning Centers.
4. Apply the use of various transducers, Micro controllers encoders and feedback devices in CAM.
5. Apply the principles of Computer Aided Process Planning in CAM.

SYLLABUS

UNIT - I
COMPUTER AIDED PROGRAMMING: General information, APT programming, Examples Apt programming problems (2D machining only). NC programming on CAD/CAM systems, the design and implementation of post processors .Introduction to CAD/CAM software, Automatic Tool Path generation.

UNIT - II

UNIT - III
POST PROCESSORS FOR CNC: Introduction to Post Processors: The necessity of a Post Processor, the general structure of a Post Processor, the functions of a Post Processor, DAPP —based- Post Processor: Communication channels and major variables in the DAPP —based Post Processor, creation of a DAPP — Based Post Processor.
UNIT - IV

UNIT - V

TEXT BOOKS:
2. CAD/CAM Principles and Applications, P.N.Rao, TMH

REFERENCES:
3. CAD / CAM Theory and Practice/ Ibrahim Zeid,TMH.
4. CAD / CAM / CIM, Radhakrishnan and Subramanian, New Age.
COURSE OBJECTIVES:

1. To teach the students to understand the fundamentals of manufacturing and prototyping for product design and development.
2. To teach the students to gain practical experience in manufacturing and prototyping for product design and development.
3. To teach the students to develop ability to apply up-to-date technology in manufacturing products with considerations of safety and environmental factors.

COURSE OUTCOMES:

1. Describe the principle and operation of common manufacturing and rapid prototyping processes for product development.
2. Decide on the use of appropriate manufacturing processes in the manufacture of a product at the design stage.
3. Apply up-to-date technology in manufacturing products with considerations of safety and environmental factors.
4. Apply the reverse engineering process for product development.
5. Appreciate and report on the common practice in the product development industry.
6. Develop a prototype with modern prototyping techniques.

SYLLABUS

UNIT-I
SURFACE TREATMENT: Scope, Cleaners, Methods of cleaning, Surface coating types, and ceramic and organic methods of coating, economics of coating. Electro forming, Chemical vapor deposition, thermal spraying, Ion implantation, diffusion coating, Diamond coating and cladding.

UNIT- II

UNIT- III
FABRICATION OF MICROELECTRONIC DEVICES: Crystal growth and wafer preparation, Film Deposition oxidation, lithography, bonding and packaging, reliability and yield, Printed Circuit boards, computer aided design in micro electronics, surface mount technology, Integrated circuit economics.
UNIT - IV
ADVANCED MACHINING PROCESSES: EDM, WireEDM, ECM, LBM, EBM, AJM, WJM – Principle, working, limitations and applications.

UNIT - V
RAPID PROTOTYPING: Working Principles, Methods, Stereo Lithography, Laser Sintering, Fused Deposition Method, Applications and Limitations, Rapid tooling, Techniques of rapid manufacturing

TEXT BOOKS:

REFERENCE BOOKS:
2. MEMS & Micro Systems Design and manufacture / Tai — Run Hsu / TMGH.
3. Advanced Machining Processes / V.K.Jain / Allied Publications.
GEOMETRIC MODELLING

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**COURSE OBJECTIVES:**

1. To highlight the importance of geometric modeling in design and manufacturing.

**COURSE OUTCOMES:**

Students will be able to

1. Use various mathematical equation to represent curves.
2. Apply the cubic splines in modeling of a product.
3. Select appropriate synthetic curves in modeling process.
4. Implement the surface modeling for design of various consumer products.

**SYLLABUS**

UNIT - I
**Cubic splines –I:** Definition, Explicit and implicit equations, parametric equations, Algebraic and geometric form of cubic spline, Hermite cubic spline, tangent vectors, parametric space of a curve, blending functions.

UNIT - II
**Cubic Splines-II:** Four point form, reparametrization, truncating and subdividing of curves. Graphic construction and interpretation, composite pc curves.
**Bezier Curves:** Bernstein basis, equations of Bezier curves, properties, derivatives.

UNIT - III
**B-Spline Curves:** B-Spline basis, equations, knot vectors, properties, and derivatives.

UNIT – IV
**Surfaces:** Bicubic surfaces, Coon’s surfaces, Bezier surfaces, B-Spline surfaces, surfaces of revolutions, Sweep surfaces, ruled surfaces, tabulated cylinder, bilinear surfaces, Gaussian curvature.

UNIT – V
**Solids:** Tricubic solid, Algebraic and geometric form.
**Solid modeling concepts:** Wire frames, Boundary representation, Half space modeling, spatial cell, cell decomposition, classification problem.
TEXT BOOKS:


REFERENCE BOOK:

COMPUTATIONAL METHODS IN ENGINEERING
(ELECTIVE-I)

Lecture : 3 Periods  Int.Marks : 30
Tutorial : 1 Period.  Ext. Marks : 70
Exam : 3 Hrs.  Credits : 3

COURSE OBJECTIVES:
1. To know how to solve system of equations, ordinary differential equations
2. and partial differential equations numerically
3. To understand correlation and regression.

COURSE OUTCOMES:
Students will be able to
1. Find the solutions of system of linear and non linear equations.
2. Solve ordinary and partial differential equations numerically.
3. Find correlation coefficient and regression.
4. Use a computer language of their choice to solve problems using numerical methods covered in the course.

SYLLABUS

UNIT – I

UNIT – II

UNIT – III
Transformation Techniques: Continuous fourier series, frequency and time domains, laplace transform, fourier integral and transform, discrete fourier transform (DFT), Fast fourier transform (FFT).
UNIT – IV


UNIT – V


TEXT BOOKS:
1. Steven C.Chapra, Raymond P.Canale ―Numerical Methods for Engineers‖ Tata Mc-Graw Hill

REFERENCE BOOKS:
3. Kreysis, Advanced Mathematics
THEORY OF ELASTICITY & PLASTICITY
(ELECTIVE-I)

Lecture : 3 Periods  Int.Marks : 30
Tutorial : 1 Period.  Ext. Marks : 70
Exam : 3 Hrs.  Credits : 3

COURSE OBJECTIVES:
1. To understand the theory of stress, strain and plasticity and enlighten the advances in plasticity and plastic strain analysis.
2. To obtain the stress strain relation within the elastic body and find the principle stress and strain for a different types of elastic body.
3. To known yield criteria for ductile metal and to understand the plastic stress-strain relations and learn Upper and lower bound theorems and corollaries.

COURSE OUTCOMES:
After Completion of this course students will be able to
1. Understand the stress and strain tensor field.
2. Understand the contact stresses analysis problem in bearing.
3. Understand advanced concepts of plasticity and plastic deformation analysis
4. Students can demonstrate Idealized stress-strain diagrams for different material models and demonstrate experimental verification of the Prandtl-Reuss equation.

SYLLABUS

UNIT-I

UNIT-II

UNIT-III
Bending of Prismatic Bars: Stress function - Bending of cantilever beam - Beam of rectangular cross-section - Beams of circular cross-section.
UNIT-IV
Plasticity: Plastic deformation of metals - Structure of metals - Deformation - Creep stress relaxation of deformation - Strain rate condition of constant maximum shear stress - Condition of constant strain energy - Approximate equation of plasticity.

UNIT-V

TEXT BOOKS:
2. An Engineering Theory of Plasticity/E.P. Unksov/Butterworths

REFERENCE BOOKS:
1. Theory of Plasticity for Engineers/Hoffman and Sacks/TMH
2. Theory of Elasticity and Plasticity/Sadhu Singh/ Khanna Publishers
NANO TECHNOLOGY
(ELECTIVE-I)

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int. Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:
1. This course introduces to the fundamentals of nano-scale engineering and manufacturing.
2. Current and future applications of nanostructured materials will be reviewed with respect
to their impact in commercial products and technologies.
3. Well-established and novel synthesis/fabrication methods nanostructures will be
discussed giving a broad overview of nanomanufacturing processes.
4. Standard characterization methods will be elucidated using various examples

COURSE OUTCOMES:
Upon successful completion of this course, students should be able to:
1. Understand the fundamental principles of nanotechnology and their application.
2. Apply engineering and physics concepts to the nano-scale and non-continuum domain.
3. Demonstrate a comprehensive understanding of nano-fabrication methods.
4. Evaluate processing conditions to engineer functional nanomaterials.
5. Practice and explain state-of-the-art characterization methods for nanomaterials,
understanding and critiquing nanomaterial safety and handling methods required during
characterization

SYLLABUS

UNIT-I
Introduction, Size and shape dependence of material properties at the nanoscale, scaling
relations, can nanorobots walk and nanoplanes fly, Nano scale elements in conventional
technologies, Mechanics at nanoscale Enhancement of mechanical properties with decreasing
size, Nanoelectromechanical systems, nano machines, Nano fluidics, filtration, sorting,
Molecular motors, Application of Nano Technology.

UNIT-II
Nano material Synthesis Techniques: Top-down and bottom-up nanofabrication, Synthesis of
nano composites, The Intel-IBM approach to nanotechnology: lithography, etching, ion
implantation, thin film deposition, nano coatings and nano indentation, Electron beam
lithography, Soft lithography: nanoimprinting and micro-contact printing, Solution/plasma-
phase nanofabrication, sol-gel methods, template techniques.

UNIT-III
Imaging/characterization of nanostructures General considerations for imaging, Scanning
probe techniques: XRD, SEM, TEM, AFM and NSOM.
UNIT-IV
Metal and semiconductor nanoparticles Synthesis, stability, control of size, Optical and electronic properties, Ultra-sensitive imaging and detection with nano particles, bioengineering applications, Catalysis. Semiconductor and metal nanowires Vapor/liquid/solid growth and other synthesis techniques, Nanowire transistors and sensors.

UNIT-V
Carbon nanotubes, Structure and synthesis, Electronic, vibrational, and mechanical properties, How can C nanotubes enable faster computers, brighter TV screens, and stronger mechanical reinforcement?

TEXT BOOKS:

REFERENCE BOOKS:
COURSE OBJECTIVES:

1. Introduce design principles, properties of materials, fits and tolerances and datum features.
2. Understand the influence of materials on form design and able to select possible material and feasible design.
3. Introduce design features to facilitate machining and design for mach inability, economy, accessibility and assembly.
4. Know about redesign of castings, modifying the uneconomical design, group technology and applications of DFMA.
5. Understand the Environmental objectives and issues and to design considering them.

COURSE OUTCOMES

The students who attend to this course

1. Select the design principle, suitable material, mechanism, fit and tolerance for designing a product/component.
2. Select the appropriate material, proper working principle and a feasible design.
3. Design (optimum) a component which requires less material removal, easy to machine, assemble, access and cost effective.
4. Redesign the uneconomical casting design and know the applications of DFMA.
5. Incorporate the Environmental Objectives, issues and guidelines into the design.

SYLLABUS

UNIT - I

UNIT - II
Machining processes: Overview of various machining processes-general design rules for machining-dimensional tolerance and surface roughness-Design for machining – ease – redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.
UNIT - III
Metal casting: Appraisal of various casting processes, selection of casting process - general design considerations for casting - casting tolerance - use of solidification, simulation in casting design - product design rules for sand casting.

Extrusion & Sheet metal work: Design guidelines extruded sections - design principles for punching, blanking, bending, deep drawing - Keeler Goodman forging line diagram – component design for blanking.

UNIT - IV
Metal joining: Appraisal of various welding processes, factors in design of weldments – general design guidelines - pre and post treatment of welds - effects of thermal stresses in weld joints design of brazed joints. Forging: Design factors for forging – closed die forging design – parting lines of dies – drop forging die design – general design recommendations.

UNIT – V
Design for Assembly Automation: Fundamentals of automated assembly systems, System configurations, parts delivery system at workstations, various escapement and placement devices used in automated assembly systems, Quantitative analysis of Assembly systems, Multi station assembly systems, single station assembly lines.

TEXT BOOKS:
1. Design for manufacture, John cobert, Adisson Wesley. 1995
2. Design for Manufacture by Boothroyd,
3. Design for manufacture, James Bralla

REFERENCE BOOK:
1. ASM Hand book Vol.20
MECHATRONICS
(ELECTIVE-II)

Lecture : 3 Periods \hspace{1cm} Int.Marks : 30
Tutorial : 1 Period. \hspace{1cm} Ext. Marks : 70
Exam : 3 Hrs. \hspace{1cm} Credits : 3

COURSE OBJECTIVES:

1. To develop an ability to identify, formulate, and solve engineering problems.
2. To develop an ability to design a system, component, or process to meet desired needs within realistic constraints.
3. To develop an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

COURSE OUTCOMES:

Upon completion of this course, students should be able to:

1. Model and analyze electrical and mechanical systems and their interconnection.
2. Integrate mechanical, electronics, control and computer engineering in the design of mechatronics systems.
3. Do the complete design building, interfacing and actuation of a mechatronic system for a set of specifications.

SYLLABUS

UNIT-I
Mechatronics systems, elements, levels of mechatronics system, Mechatronics design process, system, measurement systems, control systems, microprocessor-based controllers, advantages and disadvantages of mechatronics systems. Sensors and transducers, types, displacement, position, proximity, velocity, motion, force, acceleration, torque, fluid pressure, liquid flow, liquid level, temperature and light sensors.

UNIT-II
Solid state electronic devices, PN junction diode, BJT, FET, DIA and TRIAC. Analog signal conditioning, amplifiers, filtering. Introduction to MEMS & typical applications.

UNIT-III
Hydraulic and pneumatic actuating systems, Fluid systems, Hydraulic and pneumatic systems, components, control valves, electro-pneumatic, hydro-pneumatic, electro-hydraulic servo systems, Mechanical actuating systems and electrical actuating systems.

UNIT-IV
Digital electronics and systems, digital logic control, micro processors and micro controllers, programming, process controllers, programmable logic controllers, PLCs versus computers, application of PLCs for control.
UNIT-V
System and interfacing and data acquisition, DAQS, SCADA, A to D and D to A conversions; Dynamic models and analogies, System response. Design of mechatronics systems & future trends.

TEXT BOOKS:

REFERENCE BOOKS:
4. Mechatronics/M.D.Singh/J.G.Joshi/PHI.
COMPUTER AIDED PROCESS PLANNING
(ELECTIVE-II)

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COURSE OBJECTIVES:

To make the student understand
1. Fundamentals of computer aided process planning, group technology and applications
2. Simulation of machining processes, importance of design and manufacturing tolerances
3. Role of optimal selection of machining parameters

COURSE OUTCOMES:

1. Generate the structure of automated process planning system and uses the principle of generative and retrieval CAPP systems for automation.
2. Select the manufacturing sequence and explains the reduction of total set up cost for a particular sequence.
3. Predict the effect of machining parameters on production rate, cost and surface quality and determines the manufacturing tolerances.
4. Explain the generation of tool path and solve optimization models of machining processes.
5. Create awareness about the implementation techniques for CAPP

SYLLABUS

UNIT - I
Introduction to CAPP: Information requirement for process planning system, Role of process planning, advantages of conventional process planning over CAPP, Structure of Automated process planning system, feature recognition, methods.

UNIT - II
Generative CAPP system: Importance, principle of Generative CAPP system, automation of logical decisions, Knowledge based systems, Inference Engine, implementation, benefits.
Retrieval CAPP system: Significance, group technology, structure, relative advantages, implementation, and applications.

UNIT – III
Selection of manufacturing sequence: Significance, alternative manufacturing processes, reduction of total set-up cost for a particular sequence, quantitative methods for optimal selection, examples.
Determination of machining parameters: reasons for optimal selection of machining parameters, effect of parameters on production rate, cost and surface quality, different approaches, advantages of mathematical approach over conventional approach, solving optimization models of machining processes.
UNIT –IV
**Determination of manufacturing tolerances:** design tolerances, manufacturing tolerances, methods of tolerance allocation, sequential approach, integration of design and manufacturing tolerances, advantages of integrated approach over sequential approach.

UNIT –V
**Generation of tool path:** Simulation of machining processes, NC tool path generation, graphical implementation, determination of optimal index positions for executing fixed sequence, quantitative methods.

**Implementation techniques for CAPP:** MIPLAN system, Computer programming languages for CAPP, criteria for selecting a CAPP system and benefits of CAPP. Computer integrated planning systems, and Capacity planning system.

**TEXT BOOKS:**

**REFERENCE BOOKS:**
3. Computer Aided Engineering – David Bedworth
COURSE OBJECTIVES:

1. To impart training on SOLID WORKS for modelling of engine and automobile parts.
2. To impart training on ANSYS software for analyzing engineering problems.

COURSE OUTCOMES:

Students will be able to

1. Model the automobile parts using modelling package like SOLID WORKS
2. Analyze different engineering problems using ANSYS software

SYLLABUS

2D and 3D modelling and assembly modelling using modelling packages like AutoCAD, Auto Desk Mechanical desktop, Pro-Engineer, IDEAS.
Linear and non-linear static and dynamic analysis using any FEA package ANSYS / CAEFEM / NASTRAN.

REFERENCE BOOKS:

2. CAD/CAM Theory and Practice by Ibrahim Zeid.
SCHEME OF INSTRUCTION & EXAMINATION  
(Regulation R17)  
M.TECH (CAD/CAM)  
DEPARTMENT OF MECHANICAL ENGINEERING  
(With effect from 2017-2018 Admitted Batch onwards)  
Under Choice Based Credit System  

II-SEMESTER

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<td>M17 CAD 1209 Materials Technology</td>
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<td>M17 CAD 1210 Intelligent Manufacturing Systems</td>
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MODELLING AND SIMULATION OF MANUFACTURING SYSTEMS

Lecture : 3 Periods  Int. Marks : 30
Tutorial : 1 Period.  Ext. Marks : 70
Exam : 3 Hrs.  Credits : 3

COURSE OBJECTIVES:

1. To provide knowledge on simulation, simulation steps, parameter estimation and hypothesis.
2. To provide knowledge on building simulation model how to validation and verification is done.
3. To provide knowledge on Generation of random variants, variable and some Simulation languages.
4. To provide knowledge on some Applications of Simulation

COURSE OUTCOMES:

1. Students gain knowledge on various types of simulation and simulation languages steps in simulation and applications of simulation.
2. Students gain knowledge on parameter estimation and hypothesis.
3. Students can build simulation model and also can validate and verify model.
4. Students can gain knowledge on Generation of random variants and variables.

SYLLABUS

UNIT-I
Introduction to System and simulation: Concept of system and elements of system, Discrete and continuous system, Models of system and Principles of modeling and simulation, Monte carlo simulation, Types of simulation, Steps in simulation model, Advantages, limitations and applications of simulation, Applications of simulation in manufacturing system.

UNIT-II
Review of statistics and probability: Types of discrete and continuous probability distributions such as Geometric, Poisson, Uniform, Geometric distribution with examples, Normal, Exponential distribution with examples.

UNIT-III
Random numbers: Need for RNs, Technique for Random number generation such as Mid product method, Mid square method, and Linear congruential method with examples Test for Random numbers: Uniformity - Chi square test or Kolmogorov Smirnov test, Independence- Auto correlation test Random Variate generation: Technique for Random variate generation such as Inverse transforms technique or Rejection method.
UNIT-IV

**Analysis of simulation data:** Input data analysis, Verification and validation of simulation models, Output data analysis Simulation languages: History of simulation languages, Comparison and selection of simulation languages Design and evaluation of simulation experiments: Development and analysis of simulation models using simulation language with different manufacturing systems.

UNIT-V

**Queueing models:** An introduction, M/M/1 and M/M/m Models with examples, Open Queueing and Closed queueing network with examples

**Markov chain models and others:** Discrete time markov chain with examples, Continues time markov chain with examples, stochastic process in manufacturing, Game theory.

**TEXT BOOKS:**


**REFERENCE BOOK:**

## COURSE OBJECTIVES:

1. To understand the theory of optimization methods and algorithms developed for solving various types of optimization problems.
2. To apply the mathematical results and numerical techniques of optimization theory to concrete Engineering problems.
3. To develop and promote research interest in applying optimization techniques and reliability concepts in problems of Engineering and Technology.

## COURSE OUTCOMES:

1. Have a basic understanding of conventional, unconventional optimization algorithms and concepts of reliability.
2. Formulate engineering design problems as mathematical optimization problems and solve them by using suitable optimization technique(s).
3. Use mathematical software for the solution of engineering problems.
4. Several homework assignments delving on core concepts and reinforcing analytical skills learned in class.

## SYLLABUS

### UNIT - I

**CLASSICAL OPTIMIZATION TECHNIQUES:** Single variable optimization with and without constraints, multi-variable optimization without constraints, multi-variable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions, merits and demerits of classical optimization techniques.

### UNIT - II

**NUMERICAL METHODS FOR OPTIMIZATION:** Nelder Mead’s Simplex search method, Gradient of a function, Steepest descent method, Newton’s method, Pattern search methods, conjugate method, types of penalty methods for handling constraints, advantages of numerical methods.

### UNIT - III

**GENETIC ALGORITHM (GA):** Differences and similarities between conventional and evolutionary algorithms, working principle, reproduction, crossover, mutation, termination criteria, different reproduction and crossover operators, GA for constrained optimization, drawbacks of GA,

**GENETIC PROGRAMMING (GP):** Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, random population generation, solving differential equations using GP.

**MULTI-OBJECTIVE GA:** Pareto’s analysis, Non-dominated front, multi-objective GA, Non-dominated sorted GA, convergence criterion, applications of multi-objective problems
UNIT – IV
APPLICATIONS OF OPTIMIZATION IN DESIGN AND MANUFACTURING SYSTEMS: Some typical applications like optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam, optimization of springs and gears, general optimization model of a machining process, optimization of arc welding parameters, and general procedure in optimizing machining operations sequence.

UNIT V
RELIABILITY: Concepts of Engineering Statistics, risk and reliability, probabilistic approach to design, reliability theory, design for reliability, numerical problems, hazard analysis.

TEXT BOOKS:
2. Reliability Engineering by L.S.Srinath

REFERENCE BOOKS:
1. Optimization for Engineering Design – Kalyanmoy Deb, PHI Publishers
COMPUTER GRAPHICS

Lecture : 3 Periods
Tutorial : 1 Period.
Exam : 3 Hrs.

Int.Marks : 30
Ext. Marks : 70
Credits : 3

COURSE OBJECTIVES:

1. This course is designed to provide a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.
2. A thorough introduction to computer graphics techniques, line clipping, polygon clipping, rendering, shading algorithms and computer animation.
3. The interdisciplinary nature of computer graphics is emphasized in the wide variety of examples and applications.

COURSE OUTCOMES:

Upon completion of the subject, students will be able to

1. Understand the contemporary graphics hardware and terminology.
2. Implement graphics primitives, line clipping, polygon clipping, rendering and shading algorithms.
3. Design and implement an application which illustrates the use of output primitives and 3D viewing model.
4. Gain knowledge on computer animation and multimedia tools used for the computer representation of objects.

SYLLABUS

UNIT - I
Raster scan graphics: Raster scan and random scan architecture, Line drawing algorithms – DDA & Bresenham algorithms, circle generation, general function rasterization, displaying lines, characters and polygons.
Filling algorithms: polygon filling, edge fill algorithm, seed fill algorithm, fundamentals of antialiasing and half toning.

UNIT - II
Line CLIPPING: Simple visibility algorithm, Cohen-Sutherland subdivision line clipping algorithm, midpoint sub division algorithm.
Polygon clipping: polygon clipping, reentrant polygon clipping – Sutherland – Hodgeman algorithm, character clipping, 3D- clipping.

UNIT - III
Shading algorithms: Constant intensity algorithm, Phong’s shading algorithm, gourand shading algorithm, Comparison of shading algorithms.
UNIT - IV

Computer Animation: Design of animation sequence, general computer animation functions, raster animation, computer animation language, key frame system, motion specification.

UNIT – V

Introduction to Multimedia: Introduction, multimedia- systems, technology, architecture, trade-offs, contents, PC, Applications, data compressions, authoring system.

Multimedia Authoring Tools: Introduction, Types of authoring tools, Package based- in card authoring tools, Icon based authoring tools, Time based and presentation tools, object oriented authoring tools, author ware professional for windows (APW).

TEXT BOOKS:


REFERENCE BOOK:

FINITE ELEMENT METHODS

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<td>Exam</td>
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COURSE OBJECTIVES:

1. To introduce the concepts of finite element method to solve engineering problems.

COURSE OUTCOMES:

Students will be able to

1. Apply variational and weighted residual methods to solve differential equations.
2. Analyze 1-D bar, truss, beam and heat conduction problems using finite element method.
3. Develop finite element formulations and solve 2-D structural problems using triangular and rectangular elements.
4. Analyze vibration problems for frequencies and mode shapes.

SYLLABUS

UNIT - I
Formulation Techniques: Methodology, Engineering problems and governing differential equations, finite elements, Variational methods-potential energy method, Raleigh Ritz method, strong and weak forms, Galerkin and weighted residual methods, calculus of variations, Essential and natural boundary conditions.

UNIT – II
One-dimensional elements: Bar, trusses, beams and frames, displacements, stresses and temperature effects.

UNIT – III
Two dimensional problems: CST, LST, four noded and eight noded rectangular elements, Lagrange basis for triangles and rectangles, serendipity interpolation functions. Axisymmetric Problems: Axisymmetric formulations, Element matrices, boundary conditions.

UNIT – IV
Isoparametric formulation: Concepts, sub parametric, super parametric elements, numerical integration, Requirements for convergence, h-refinement and p-refinement, complete and incomplete interpolation functions, Pascal’s triangle, Patch test.
Heat Transfer problems: Conduction and convection, examples: - two-dimensional fin.
UNIT – V
Finite elements in Structural Analysis: Static and dynamic analysis, eigen value problems, and their solution methods, case studies using commercial finite element packages.

TEXT BOOK:
1. Finite element methods by Chandrupatla & Belagundu.

REFERENCE BOOKS:
COURSE OBJECTIVES:

To make the student understand
1. Quality standards and need for standardization
2. Development and implementation of quality measurement systems
3. Application of six sigma approach to various industrial situations
4. Concept of Analysis of Variance, Orthogonal Arrays and statistical methodology.

COURSE OUTCOMES:

The student will be able to
1. Explain quality standards and need for standardization
2. Implement quality measurement systems in various applications
3. Implement six sigma approach for various industrial applications
4. Gain knowledge on Analysis of Variance, Orthogonal Arrays and statistical methodology.

SYLLABUS

UNIT - I
QUALITY VALUE AND ENGINEERING: An overall quality system, quality engineering in production design, quality engineering in design of production processes. Loss Function and Quality Level: Derivation and use of quadratile loss function, economic consequences of tightening tolerances as a means to improve quality, evaluations and types tolerances.(N-type, S-type and L-type)

UNIT II:
TOLERANCE DESIGN AND TOLERANCING: Functional limits, tolerance design for N-type. L-type and S-type characteristics, tolerance allocation for multiple components. Parameter and Tolerance Design: Introduction to parameter design, signal to noise ratios, Parameter design strategy, some of the case studies on parameter and tolerance designs.

UNIT - III
ANALYSIS OF VARIANCE (ANOVA): Introduction to ANOVA, Need for ANOVA, NO-way ANOVA, One-way ANOVA, Two-way ANOVA, Critique of F-test, ANOVA for four level factors, multiple level factors.
UNIT - IV
ORTHOGONAL ARRAYS: Typical test strategies, better test strategies, efficient test strategies, steps in designing, conducting and analyzing an experiment. Interpolation of Experimental Results: Interpretation methods, percent contributor, estimating the mean.

UNIT - V
SIX SIGMA AND THE TECHNICAL SYSTEM: Six sigma DMAIC methodology, tools for process improvement, six sigma in services and small organizations, statistical foundations, statistical methodology.

TEXT BOOK:

REFERENCE BOOKS:
MECHANICAL VIBRATIONS  
(ELECTIVE-III)

Lecture : 3 Periods  
Tutorial : 1 Period.  
Exam : 3 Hrs.  

Int.Marks : 30  
Ext. Marks : 70  
Credits : 3

COURSE OBJECTIVES:

1. To gain the knowledge of mathematical modeling of a physical system and applying the principles of Newton's Second Law and conservation of energy to derive the equations of motion.
2. To study the response of a vibrating system with periodic excitation and understand the principle of vibration isolation.
3. To develop the equations of motion for a continuous system in elongation, bending and torsion to find the natural frequencies and mode shapes.

COURSE OUTCOMES:

Students will be able to

1. Develop a mathematical model for a physical system and derive the governing differential equations.
2. Determine the natural frequencies of single and two degrees of freedom systems without and with damping.
3. Determine and analyze the response of machine members or structures in forced vibration with different excitation frequencies.
4. Apply the techniques of vibration isolation to minimize the transmission of vibrating forces.
5. Determine the natural frequencies and mode shapes of bars in elongation and torsion and beams in bending.

SYLLABUS

UNIT- I

Single degree of Freedom systems: Undamped and damped free vibrations: forced vibrations ; coulomb damping; Response to harmonic excitation; rotating unbalance and support excitation, Vibration isolation and transmissibility, Vibrometers, velocity meters & accelerometers.

UNIT- II

Response to Non Periodic Excitations: unit Impulse, unit step and unit Ramp functions; response to arbitrary excitations, The Convolution Integral; shock spectrum; System response by the Laplace Transformation method.
UNIT-III
Multi degree freedom systems: Principal modes – undamped and damped free and forced vibrations; undamped vibration absorbers, Matrix formulation, stiffness and flexibility influence coefficients; Eigen value problem; normal modes and their properties; Free and forced vibration by Modal analysis; Method of matrix inversion; Torsional vibrations of multi – rotor systems and geared systems; Discrete-Time systems.

UNIT IV
Numerical Methods: Rayleigh’s, Stodola’s, Matrix iteration, Rayleigh-Ritz Method and Holzer’s methods

UNIT V

TEXT BOOKS:
1. Elements of Vibration Analysis by Meirovitch.

REFERENCE BOOKS:
1. Vibrations by W.T. Thomson
CONCURRENT ENGINEERING
(ELECTIVE-III)

Lecture : 3 Periods \hspace{1cm} \text{Int.Marks} : 30
Tutorial : 1 Period. \hspace{1cm} \text{Ext. Marks} : 70
Exam : 3 Hrs. \hspace{1cm} \text{Credits} : 3

COURSE OBJECTIVES:
1. To study about concurrent engineering.
2. To learn about applications of concurrent engineering in product design and manufacturing.
3. To learn about automation of assembly workstations & fabrication systems.

COURSE OUTCOMES:
Upon completion of this course, students should able to:
1. Understand the concepts of concurrent engineering and its application in design and manufacturing of a product
2. Know how to solve issues arising during design and manufacturing of a product
3. Understand the importance of tolerances in product design and manufacturing
4. Understand how to automate a work station & fabrication system.
5. Understand the importance of human resource management

SYLLABUS

UNIT I:
INTRODUCTION
Extensive definition of CE - CE design methodologies - Organizing for CE - CE tool box collaborative product development

USE OF INFORMATION TECHNOLOGY
IT support - Solid modeling - Product data management - Collaborative product commerce - Artificial Intelligence - Expert systems - Software hardware co-design.

UNIT II:
DESIGN STAGE
Life-cycle design of products - opportunity for manufacturing enterprises - modality of Concurrent Engineering Design –Automated analysis idealization control - Concurrent engineering in optimal structural design -Real time constraints.

UNIT III:
MANUFACTURING CONCEPTS AND ANALYSIS
Manufacturing competitiveness - Checking the design process - conceptual design mechanism –Qualitative, physical approach - An intelligent design for manufacturing system
UNIT IV:

PROJECT MANAGEMENT
Life Cycle semi realization - design for economics - evaluation of design for manufacturing cost

UNIT V
Concurrent mechanical design - decomposition in concurrent design - negotiation in concurrent engineering design studies - product realization taxonomy - plan for Project Management on new product development – bottleneck technology development.

TEXT BOOKS:

REFERENCE BOOKS:
MECHANICS & MANUFACTURING METHODS OF COMPOSITES  
(ELECTIVE-IV)

Lecture : 3 Periods  
Tutorial : 1 Period.  
Exam : 3 Hrs.  
Int.Marks : 30  
Ext. Marks : 70  
Credits : 3

COURSE OBJECTIVES:

1. Study the types of fibers and their structure and behaviors. 
2. Study the mathematical analysis of stresses acting on the composites. 
3. Expose to the various manufacturing processes & testing methods of Composites. 
4. Understand the design principles of composites

COURSE OUTCOMES:

After Completion of this course students will be able to

1. Gain knowledge on fiber characteristics and methods of production of fibers. 
2. Identify the suitable composite manufacturing process when designing intricate and critical parts made of composites. 
3. Analyse the elastic behaviour of composites and composite laminated plates. 
4. Gain knowledge on the failure of composites and the production of quality composites.

SYLLABUS

UNIT – I


UNIT – II


UNIT – III

Elastic behavior of unidirectional composites: Elastic constants of lamina, relationship between engineering constants and reduced stiffness and compliances, analysis of laminated composites, constitutive relations.
**Strength of unidirectional lamina:** Micro mechanics of failure, Failure mechanisms, Strength of an orthotropic lamina, Strength of a lamina under tension and shear maximum stress and strain criteria, application to design. The failure envelope, first ply failure, free-edge effects. Micro mechanical predictions of elastic constants.

**UNIT – IV**
**Analysis of laminated composite plates**
Introduction, thin plate theory, specially orthotropic plate, cross and angle ply laminated plates, problems using thin plate theory.

**UNIT – V**
**Manufacturing methods:** Autoclave, tape production, moulding methods, filament winding, hand layup, pultrusion, RTM.

**TEXT BOOKS:**

**REFERENCE BOOKS:**
MATERIALS TECHNOLOGY  
(ELECTIVE-IV)  

Lecture : 3 Periods  
Tutorial : 1 Period.  
Exam : 3 Hrs.  

Int.Marks : 30  
Ext. Marks : 70  
Credits : 3

COURSE OBJECTIVE:

1. To understand the relationship between the structure, properties, processing, testing and applications of strengthening mechanism, modern metallic, smart, non-metallic, advanced structural ceramic and composite materials so as to identify and select suitable materials for various engineering applications.

COURSE OUTCOMES:

Students will be able to

1. Gain knowledge on mechanism of plastic deformation and strengthening mechanism.
2. Learn the structure, properties and applications of modern metallic materials, smart materials non-metallic materials and advanced structural ceramics.
3. Understand the importance of advanced composite materials in application to sophisticated machine and structure of components.

SYLLABUS

UNIT I:
Elasticity in metals, mechanism of plastic deformation, slip and twinning, role of dislocations, yield stress, shear strength of perfect and real crystals, strengthening mechanism, work hardening, solid solution, grain boundary strengthening. Poly phase mixture, precipitation, particle, fiber and dispersion strengthening, effect of temperature, strain and strain rate on plastic behavior, super plasticity, Yield criteria: Von-mises and Tresca criteria.

UNIT II:
Griffith’s Theory, stress intensity factor and fracture Toughness, Toughening Mechanisms, Ductile and Brittle transition in steel, High Temperature Fracture, Creep, Larson – Miller parameter, Deformation and Fracture mechanism maps.

UNIT III:
Fatigue, fatigue limit, features of fatigue fracture,Low and High cycle fatigue test, Crack Initiation and Propagation mechanism and paris Law, Effect of surface and metallurgical parameters on Fatigue, Fracture of non-metallic materials, fatigue analysis, Sources of failure, procedure of failure analysis, Motivation for selection, cost basis and service requirements, Selection for Mechanical Properties, Strength, Toughness, Fatigue and Creep.
UNIT IV:
MODERN METALLIC MATERIALS: Dual Steels, Micro alloyed, High Strength Low alloy (HSLA) Steel, Transformation induced plasticity (TRIP) Steel, Maraging Steel, Inter metallics, Ni and Ti Aluminides. Processing and applications of Smart Materials, Shape Memory alloys, Metallic Glass Quasi Crystal and Nano Crystalline Materials.

UNIT V:

TEXT BOOKS:

REFERENCE BOOKS:
2. Engineering Materials Technology/James A Jacob Thomas F Kilduff/Pearson
3. Material Science and Engineering/William D Callister/John Wiley and Sons
4. Plasticity and plastic deformation by Aritzur.
INTELLIGENT MANUFACTURING SYSTEMS
(ELECTIVE-IV)

Lecture : 3 Periods  Int.Marks : 30
Tutorial : 1 Period.  Ext. Marks : 70
Exam : 3 Hrs.  Credits : 3

COURSE OBJECTIVES:

1. To understand the importance of intelligence in manufacturing systems, so as to apply the artificial intelligence in the application of manufacturing.

COURSE OUTCOMES:

2. Students will be able to learn the Components of Knowledge Based Systems, Machine Learning and Knowledge Based System for Equipment Selection.
3. Students will be able to understand and solve the group technology problems by using knowledge based system.

SYLLABUS

UNIT I:

UNIT II:
COMPONENTS OF KNOWLEDGE BASED SYSTEMS - Basic Components of Knowledge Based Systems, Knowledge Representation, Comparison of Knowledge Representation Schemes, Interference Engine, Knowledge Acquisition.

UNIT III:
MACHINE LEARNING - Concept of Artificial Intelligence, Conceptual Learning, Artificial, Neural Networks - Biological Neuron, Artificial Neuron, Types of Neural Networks, Applications in Manufacturing.

UNIT IV:
UNIT V:


TEXT BOOKS:
1. Intelligent Manufacturing Systems/ Andrew Kusiak/Prentice Hall.

REFERENCE BOOK:
COMPUTER AIDED MANUFACTURING LAB

Lab : 3 Periods  Int. Marks : 50
Exam : 3 Hrs Ext. Marks : 50
Credits : 2

COURSE OBJECTIVES:

1. To give a job oriented training on the CNC Lathe and CNC Milling Machine.
2. To study programming and machining on CNC Lathe and CNC Milling.
3. To study select/apply/implement tooling, machine setting, work holding techniques etc. along with basic maintenance.

COURSE OUTCOMES:

Students will be able to

1. Illustrate the importance of NC and CNC technology in manufacturing industry.
2. Generate Part Programming with application of CAD/CAM systems in particular for complex models.
3. Identify and select proper NC toolings

SYLLABUS

Manual and computer assisted part programming exercises on CNC machine tools.
Surface generation, Tool selection, NC code generation and Tool path simulation for turning and milling operations using CAM packages like CATIA, Gibbs CAM, Master CAM.
Robot programming off-line and on-line.

REFERENCE BOOKS:

SCHEME OF INSTRUCTION & EXAMINATION  
(Regulation R17)  

M.TECH (CAD/CAM)  

DEPARTMENT OF MECHANICAL ENGINEERING  

(With effect from 2017-2018 Admitted Batch onwards)  
Under Choice Based Credit System  

III-SEMESTER  

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1. The Viva-Voce for the Comprehensive Viva-Voce and Seminar-I shall be held with the Project Guide, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.

2. Candidates can do their Project Work Part-I&II work within the department or in any industry/research organization for two semesters (i.e. 3rd and 4th semesters). In case of thesis done in an industry/research organization, one advisor (Guide) should be from the department and one advisor (Co-Guide) should be from the industry/research organization.

3. The Project Work Part-I should be submitted at the end of 3rd Semester and it will be evaluated through Review by a committee consisting of Head of the Department, PG coordinator and Project guide. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.
SCHEME OF INSTRUCTION & EXAMINATION  
(Regulation R17)

M.TECH (CAD/CAM)  
DEPARTMENT OF MECHANICAL ENGINEERING  
(With effect from 2017-2018 Admitted Batch onwards)  
Under Choice Based Credit System

IV-SEMESTER

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1. The viva-voce for Seminar-II shall be held with the Project Guide, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.

2. A publication of a paper on the thesis work in a National/International Journal at the end of 4th semester is mandatory for the submission of thesis work.

3. The Project Work Part-II should be submitted at the end of 4th semester and it will be evaluated through Viva–Voce examination by a committee consisting of External Examiner, Head of the Department, Project guide and PG coordinator. The marks shall be awarded in the ratio of 40, 20, 20 and 20 Marks by the members respectively.