### I – SEMESTER

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### Course Code

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<td>M16 ST 1106</td>
<td>Wind Analysis and Design of Tall Structures</td>
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<td>M16 ST 1107</td>
<td>Experimental Stress Analysis</td>
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COURSE OBJECTIVES:

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

**Plane Stress and Plane Strain**: Components of stress, Strain, Hookes law, Stress and strain at a point. Plane stress, Plane strain, Equations of equilibrium, Boundary conditions, Compatibility equations stress foundation.

**Two Dimensional Problems in Rectangular Coordinates**: Solution by polynomials, Saint Venant’s principle determination of displacements, Bending of cantilever loaded at the end, Bending of a beam by uniform load.

**Two Dimensional Problem in Polar Coordinates**: General equations of equilibrium, Stress function and equation of compatibility with zero body forces. Analysis of thick cylindrical shells with symmetrical leading about the axis, Pure bending of curves bars, Strain components in polar coordinates, Rotating disks.


**Torsion**: Torsion of straight bars – St.-Venant solution – Stress function, Warp function – Elliptic cross section – Membrane analogy torsion of bar of narrow rectangular cross section.

**Analysis of Stress and Strain in Three Dimensions**: Introduction – Principal stresses, Determination of principal stress – Stress invariants – Maximum sheering stress strain at point.

TEXT BOOK:

REFERENCE BOOKS:
3. “Advanced Strength of Materials” by Denhortog, Dover publications
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 bunkers, silos and chimneys.
5. 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 bunkers, silos and chimneys.
5. Analyze and design of concrete structures against fire resistance, according to ISO 834 standards.

SYLLABUS

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.


Redistribution of Moments in Reinforced Concrete Beams: Introduction, Redistribution of moments in fixed beam, Positions of points of contra flexures, 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.

**Design of Flat Slabs:** Introduction, Proportioning of Flat Slabs, Determination of Bending moment and Shear Force, Direct Design method, Equivalent Frame method, Slab Reinforcement.

**Bunkers and Silos:** Introduction, Design of Rectangular Bunkers, Design of Tension member, Design of Circular Bunker, Design of Silos.

**Chimneys:** Introduction, Design factors, Stresses due to Self Weight and Wind load, Stress in horizontal reinforcement, Temperature Stresses, Combined effect of Self Weight, Wind load and Temperature, Temperature stresses in Hoop(Horizontal) Reinforcement.

**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.
MATRICES METHODS OF STRUCTURAL ANALYSIS

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<td>Ext. Marks</td>
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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


Matrix methods for Plane truss problems: Analysis of 2-D trusses by flexibility method. Analysis of 2-D trusses by stiffness method

Matrix methods for Plane Frames: Analysis of 2-D frames by Flexibility matrix methods. Analysis of 2-D frames by Stiffness matrix methods.

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

One Degree Systems: Undamped systems, Various forcing functions damped systems, Response to pulsating force, Support motion.

Lumped Mass Multidegree System: Direct determination of natural frequencies, Characteristic shapes, Stodola-Vianelle method, Modified Rayleigh-Ritz method, Lagrange’s equation, Model analysis of multi degree systems, Multistorey rigid frames subjected to lateral loads, Damping in multi degree systems.

Structures with distributed mass and load, Single span beams, Normal modes of vibration, Forced vibrations of beams, Beams with variable cross-section and mass.
Approximate design methods, Idealized system, Transformation factors, Dynamic reactions response calculations, Design example (RC beam, Steel beam and RC slab), Approximate design of multi degree systems.

Matrix Approach: Coordinates and lumped masses, Consistent mass matrix, Undamped force vibration of a system with one degree freedom, Response of single degree freedom undamped system, Viscous damped vibration of a single degree freedom system, Undamped vibration of multi degree freedom system, Orthogonality of natural nodes, Normal coordinates.

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
ADVANCED FOUNDATION ENGINEERING

<table>
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COURSE OBJECTIVES:

The main objectives of this Course is
1. To enable participants select the best foundation solutions for different types of Civil Engineering problems
2. To develop deeper understanding of foundation analysis.
3. To develop understanding of choice of design parameters.
4. To learn about advanced topics of foundation design and analysis.
5. Participants will be equipped with abilities to evaluate bearing capacity and settlement failure conditions for shallow and deep foundations.

COURSE OUTCOMES:

After completion of course students should be able to
1. The design of shallow and deep foundations to carry ultimate loads.
2. Interpretation and selection of appropriate soil parameters from site investigation data.
3. Field monitoring in geotechnical design.
4. Select the most appropriate foundation solution for a given situation; derive appropriate soil parameters.
5. Distinguish between different foundation types and their appropriate use.
6. Synthesize foundation performance measurements from a range of test data reported in the literature.

SYLLABUS

Foundations, Types of shear failures in foundation soils, Types of foundations,

Bearing Capacity Analysis: Bearing capacity theories – Terzaghi, Meyerhof, Skempton, Hansen, Vesic and IS Methods, Bearing capacity evaluation from Standard Penetration test and Plate load test.

Settlement Analysis: Uniform and Differential Settlements, Elastic and Consolidation Settlements, Settlement analysis in cohesion less soils by Schemartmann and Hartman method, Penetration tests; Permissible settlements as per IS 1904-1978, causes of settlement, settlement Control.

**Deep Foundations**: Pile Foundations: Types, load capacity - dynamic formulae, static formula; pile load tests - Vertical load test, lateral load test, Cyclic load test; settlement of piles and pile groups, negative skin friction on single pile and pile groups; laterally loaded piles - Broom’s Analysis, IS Code method; Under reamed piles – Load capacity, design and construction.

**Well Foundations**: Types, Bearing Capacity of well foundations, Construction of pneumatic caissons, Tilts and Shifts: precautions, Remedial measures; Lateral stability analysis by Terzaghi’s Method, Design aspects of Components of well foundation.


**TEXT BOOKS**:
2. Foundation Engineering by P.C. Vargheese, Prentice Hall of India

**REFERENCE BOOKS**:
WIND ANALYSIS AND DESIGN OF TALL STRUCTURES

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 OUTCOME:
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.
3. Design the shear wall system and in filled frame systems.
4. Design the RC chimney and Bunkers and Silos.

SYLLABUS

Introduction: Basic wind speed, Design wind speed, Design wind pressure, offshore wind velocity, wind pressures and forces in buildings/structures, External pressure coefficients for various roofs, dynamic effects.


Design of Shear Wall: Introduction, Types of shear walls, Behaviour of cantilever wall with rectangular cross-section, flange cantilever shear walls, Moment-Axial load interaction for shear wall section, Interaction of shear walls and rigid joined frames, Shear walls with openings, Coupled shear walls.

Design of Chimneys (RCC): Introduction, Wind pressure, Stress in chimney shaft due to self weight and wind, Stress in horizontal reinforcement due to wind shear, Stresses due to temperature difference. Design of RC chimney.

Bunkers and Silos: Introduction, Differences between bunker and silo, Design of square or rectangular bunkers, Design of circular bunkers, Design of silos, Silos for storage of cement.

Multistory Building Frames: Analysis of multistory frames, Method of substitute frames, Bending moments in beams and columns.

TEXT BOOKS:

REFERENCE BOOKS:
1. “Reinforced Concrete Structures” by Park, R. & Paulay, T, Wiley publications
COURSE OBJECTIVES:

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.
4. Analysis of Stress, strain, Stress-Strain relation and theories of failure

SYLLABUS

**Electrical Resistance Strain Gauges:** Principle of operation and requirements, Types and their uses, Materials for strain gauge. Calibration and temperature compensation, cross sensitivity, Rosette analysis, Wheatstone bridge and potentiometer circuits for static and dynamic strain measurements, strain indicators.

**Photoelasticity:** Two dimensional photo elasticity, Concept of light – photoelastic effects, stress optic law, Interpretation of fringe pattern, Compensation and separation techniques, Photo elastic materials. Introduction to three dimensional photo elasticity.

**Brittle Coating And Moire Methods:** Introduction to Moire techniques, brittle coating methods and holography.

**TEXT BOOK:**

**REFERENCE BOOK:**
ADVANCED CONCRETE TECHNOLOGY

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:
1. This course mainly aims to develop the knowledge about properties of cement concrete and importance of admixtures in concrete.

COURSE OUTCOMES:
Upon completion of this course, the student will be able to
1. Know the various materials in concrete and admixtures.
2. Do the Mix design by different methods.
3. Get a thorough knowledge of various types of cement, aggregates and properties of special concrete.
4. Know the different procedures for testing concrete

SYLLABUS

Durability of concrete and concrete construction: Durability concept, pore structure and transport processes, reinforcement corrosion, fire resistance, frost damage, sulphate attack, alkali silica reaction, delayed ettringite formation, methods of providing durable concrete, short-term tests to assess long-term behaviour.

Mix design: Review of methods and philosophies of IS, BS and ACI methods, mix design for special purposes. Acceptance criteria for compressive strength of concrete.


Special processes and technology for particular types of structure: Sprayed concrete, underwater concrete, grouts, grouting and grouted concrete, mass concrete, slip form construction, pumped concrete, concrete for liquid retaining structures, vacuum process, concrete coatings and surface treatments.

Test methods: Analysis of fresh concrete, Accelerated testing methods, Tests on hardened concrete, Core cutting and testing, partially destructive testing, Non-destructive testing of concrete structures

TEXT BOOKS:
2. Concrete Technology Theory and Practice, M.S.Shetty, S.Chand& Company Ltd, New Delhi.

REFERENCE BOOKS:
BRIDGE ENGINEERING

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVE:

1. This subject is taught to impart the knowledge in the analyses and design of concrete bridges.

COURSE OUTCOMES:

Upon completion of this course, the student will be able to
1. Understood the load distribution and IRC standards.
2. Design the slab bridges.
3. Design the Arch bridges and
4. Design the bridge bearings, hinges and expansion joints.

SYLLABUS


Analysis and design of Slab Bridge, Skew slab bridge.

Analysis and design of T-beam bridge: Deck slab considering IRC loads, longitudinal girders (Interior, Exterior), Cross girder.

Analysis and design of prestressed concrete girder and box girder bridges considering only primary torsion, Design of end block.

Bridge Bearing: Types of bearings, Rocker bearing, Elastomeric bearing.

TEXT BOOKS:

REFERENCE BOOKS:
2. Bridge Engineering By S.Ponnu Swamy, McGraw Hill Education.
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

SYLLABUS

Introduction: Need and scope of optimization, Historical development, Statement of an 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 behaviour (Monotonic, Non-Monotonic and Unimodal)

Fully stressed design and optimally criterion based algorithms, Introduction, Characteristics of fully stressed design theoretical basis – Examples.


Introduction to quadratic programming, Geometric programming and Dynamic programming. Design of beams and frame using dynamic programming technique.

TEXT BOOKS:
REFERENCE BOOKS:

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

Application of software’s in Structural Engineering (by using STAAD Pro, ETABS STRAP, STRUDS etc) for the following problems.

1. Analysis and Design of Beams.
3. Analysis and Design of Trusses.
4. Analysis and Design of Two Dimensional Frames.
5. Analysis and Design of Three Dimensional Frames.
6. Analysis and Design of Water Tanks.
7. Analysis and Design of Steel Members.

REFERENCE BOOKS:

1. Computer Applications In Structural Engineering by David R.Jenkins, American Society of Civil Engineers
DESIGN OF STRUCTURES
(VIVA-VOCE)

Tutorial : 3 Periods
Exam : 3 Hrs.

Sessionals : 50
Ext. Marks : 50
Credits : 2

COURSE OBJECTIVES:

1. To Design of Folded Plates
2. To Elevated Service Reservoirs
3. To analysis and design Retaining walls
4. To design Grid floor
5. To design Flat slab
6. To design Pressed steel tank
7. To design Buried pipes

COURSE OUTCOMES:

Upon completion of this course, the student will be able to
1. Design of Folded Plates, Elevated Service Reservoirs, Analysis and design Retaining walls,
   Design Grid floor, Design Flat slab, Design Pressed steel tank, Design Buried pipes

SYLLABUS

On any THREE of the following:

1. Design of Folded Plates
2. Elevated Service Reservoirs
3. Retaining walls
4. Grid floor
5. Flat slab
6. Pressed steel tank
7. Buried pipes

REFERENCE BOOKS:

1. “Advanced Reinforced Concrete Design” by P.C. Varghese., PHI Learning pvt. Ltd
3. “Advanced Reinforced Concrete Design” by N.Krishna Raju,CBS publishers & distributors pvt Ltd.
DEPARTMENT OF CIVIL ENGINEERING
M.TECH (STRUCTURAL ENGINEERING)

Scheme of Instruction and Examination
(Regulation: R16)

(with effect from 2016-2017 admitted batch onwards)

II – SEMESTER

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<td>M16 ST 1208  Industrial Structures</td>
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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 curvature in shells.
4. Gain knowledge on beams, theory of cylindrical shells.

SYLLABUS


Symmetrical Bending of Circular Plates: Differential equation – Boundary conditions. Simply supported rectangular plates under sinusoidal loading – Naviers solution and its application to concentrated load – Levy’s solution for uniformly distributed load or hydrostatic pressure – Bending of rectangular plates by moments distributed along the edges – Differential equation of rectangular plate within plane and lateral forces.

Membrane analysis:
   a) Shells of revolution (axi-symmetrical loading), Spherical shells, Conical shells, Elliptical shell of revolution, Torus, Hyperboloid of revolution of one sheet, Shells of uniform strength membrane deformation.
   b) Membrane analysis of shells of translation, Circular cylinder, Diretrix, Parabola, Cycloid, Catenary and Membrane deformations.
   c) Membrane analysis of shells of general shape: Anticlastic, Synclastic shells, Hyperbolic paraboloid, Candella shells, Conoid, Elliptic paraboloid, Rotational paraboloid.


TEXT BOOK:

REFERENCE BOOKS:
1. “Design of Reinforced Concrete Shells and Folded Plates” by P.C.Varghese, PHI
2. “Stresses in Shells” by Flugge, Springer
STRUCTURAL STABILITY

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<td>Exam</td>
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<td>Credits</td>
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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 inelastic buckling.

SYLLABUS

**Buckling of Columns:** Method of neutral equilibrium, Critical load of the Euler column, Linear column theory – An eigen value problem, Effective length concept, Higher order differential equation for columns initially bent columns, Effect of shear stress on buckling, eccentrically loaded columns, beam columns (Beam columns with concreted lateral load, distributed, load end moment), Inelastic buckling of columns, Double modulus theory, Tangent modulus theory, Shanley theory of inelastic column behaviour.

**Approximate Methods of Analysis:** Conservation of energy principles, Calculation of critical loads using approximate deflection curve, Principle of stationary potential energy, Raleigh-Ritz method, Buckling load of column with variable cross-section, Galerkin’s method, Calculation of critical load by finite differences, Unevenly spaced pivot points, Matrix stiffness method, Effect of axial load on bending stiffness-slope deflection equations, Buckling of column loaded along the length using energy methods.

**Buckling of Frames:** Modes of buckling, Critical load of a simple frame using neutral equilibrium, Slope deflection equations and matrix analysis. Lateral buckling of cantilever and simply supported beams of rectangular and I-sections and use of energy method and finite differences.

**Buckling of Plates:** Differential equation, Strain energy of bending, Critical load, Finite difference approach inelastic buckling of plates.

**Matrix approach for Frames:** Criterion for determination of critical loads, Stiffness influence coefficients for members without axial load, Derivation of stability functions, Problem involving Non-sways, Modified stiffness of beams, Frames with sway, Multi-bar frames.

**TEXT BOOKS:**

**REFERENCE BOOKS:**
CODE: M16 ST 1203

FINITE ELEMENT METHODS OF ANALYSIS

<table>
<thead>
<tr>
<th>Theory</th>
<th>4 Periods</th>
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<tbody>
<tr>
<td>Exam</td>
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<tr>
<td>Sessionals</td>
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<td>Ext. Marks</td>
<td>70</td>
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<tr>
<td>Credits</td>
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</tbody>
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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.
5. Determine solution for higher order elements problems by numerical techniques.

SYLLABUS


Theory relating to the formulation of the finite element method. Coordinate system (local and global), generalized coordinates, Concept of the element, Various element shapes, Discretisation of a structure, Mesh refinement Vs. Higher order element, Interconnections at nodes of displacement models, inter element compatibility, -shape functions.

Basic component – One dimensional FEM single bar element, Beam element: Derivation of stiffness matrix, Assembly of stiffness, Matrix boundary conditions, shape functions for 1 D elements, Initial strain and temperature effects, and trusses under axial forces.

Two dimensional FEM: Different types of elements for plane stress and plane strain analysis – Displacement models Generation of element stiffness and nodal load matrices –static condensation.


TEXT BOOKS:
1. Introduction to Finite element Method by Tirupathichandra Patla and Belugundu, PHI

REFERENCE BOOKS:
EARTHQUAKE ENGINEERING

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:

1. To impart the knowledge of designing earthquake resistant structures and familiarize the code provisions.

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 codal provisions and detailing.
4. Acquire the knowledge in structural irregularities in seismic planning and shear wall concept.

SYLLABUS

One Degree Systems: Undamped systems, Various forcing functions damped systems, Response to pulsating force, Support motion. Lumped Mass Multidegree System: Direct determination of natural frequencies, Characteristic shapes, Stodola-Vianelle method, Modified Rayleigh-Ritz method, Lagrange’s equation, Model analysis of multi degree systems, Multistorey rigid frames subjected to lateral loads, Damping in multi degree systems.

Matrix Approach: Coordinates and lumped masses, Consistent mass matrix, Undamped force vibration of a system with one degree freedom, Response of single degree freedom undamped system, Viscous damped vibration of a single degree freedom system, Undamped vibration of multi degree freedom system, Orthogonality of natural nodes, Normal coordinates.


Earthquake analysis of Multistorey buildings: By seismic coefficient method and Response spectrum method, Base shear, Fundamental period of buildings, Distribution of forces along the height.

Earthquake analysis of Water towers: Introduction, Behaviour under earthquake loads, Design features, Water tower as a rigid jointed space frame, Hydrodynamic pressures in tanks.

Earthquake analysis of Stack like structures: Introduction, Fundamental period of vibration, Dynamic bending moment, Shear diagram.
Earthquake analysis of dams: Hydrodynamic pressures on dams, Zanger’s method, Vertical component of reservoir load, Concrete or masonry gravity dams.

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

REFERENCE BOOKS:
2. “Structural Analysis” by A. Ghali & A.M. Neville, CRC press
3. “Earthquake resistant design of structures” by PankajAgarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.
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

Concepts of Structural Safety: General, Design methods.

Basic Statistics: Introduction, Data reduction, Histograms, Sample correlation.


Probabilistic Analysis of Loads: Gravity loads, Wind load.


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

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

| Theory     | : 4 Periods | Sessionals | : 30 |
| Exam       | : 3 Hrs.    | Ext. Marks | : 70 |
| Credits    | : 4        |

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.
5. Apply the concept of prestress for designing of slabs.

SYLLABUS

Introduction: Basic concepts of prestressing need for high strength steel and concrete, advantages of prestressed concrete. Materials for prestressed concrete, high strength concrete and high strength steel.

Prestressing systems and losses of prestress: (1) Freyssinet Anchorage System (2) Gifford Udall System (3) Magnel-Blaton System, Tensioning devices, anchoring devices. (d) Pretensioning and Post tensioning. Prestressing losses, Elastic shortening, loss due to shrinkage, loss due to creep, loss due to friction, loss due to slip etc.I.S.code provisions.

Analysis of prestressed Concrete Beams: Assumptions, Analysis of prestress, Resultant stresses at a section, pressure or thrust line, concept of load balancing, cable profile, kern distance, stress in tendons as per IS 1343, cracking moment.

Shear and Torsional Resistance of Prestressed Concrete Members: Shear and Principal Stresses, Ultimate Shear Resistance of Prestressed Concrete Members, Design of Shear Reinforcements, Prestressed Concrete members In Torsion, Design of Reinforcements for Torsion, Shear and Bending.


Anchorage zone in post tensioned members: Introduction, stress distribution in End block, Investigation on Anchorage Zone Stresses- Magnel’s method, Guyon’s method of approach of analysis of end block (Not more than 2 cables).

Deflection of Prestressed Concrete Members: Importance of Control of Deflections, Factors Influencing Deflections, Short-Term Deflection of Uncracked members, Prediction of Long Time Deflections, Deflection of Cracked Members, Requirements of various Codes of Practice.
TEXT BOOKS:  
1. Prestressed Concrete by N.KrishnaRaju, TataMcGrawhill, NewDelhi  

REFERENCE BOOKS:  
1. Prestressed Concrete by N.Rajagopalan, Alpha Science publications.  
2. Prestressed Concrete by P. Dayaratnam, Delhi publications.
COURSE OBJECTIVES:

1. To introduce the various types of improvement methods of engineering properties soils.
2. To introduce the application of engineering methods to ground improvement projects.

COURSE OUTCOMES:

After completion of course students should be able to
1. Implement the stabilization methods
2. Apply grouting and dewatering techniques
3. Understand the concept of in-situ reinforcement

SYLLABUS

Compaction: Theory of compaction, Shallow Surface Compaction - Equipment, Placement water content, factors affecting shallow compaction; Deep compaction: Methods - Vibrofloatation, Terra probe method, Pounding, Blasting, Compaction piles; Compaction Control.

Vertical Drains: Sand drains, Sand wicks, Rope drains, Design of vertical drains, Stone columns, application of the techniques to Marine clays.


Dewatering: Definition, necessity, Methods of dewatering – Interceptor ditch, Single, Multistage and Vacuum well points, Horizontal wells, Electro-osmosis. Permanent drainage by Foundation drains and Blanket drains.


TEXT BOOK:

REFERENCE BOOK:
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. Get an idea about the materials used and planning.
3. Know the construction techniques.
4. Understood the functional requirements.

SYLLABUS

**Plastic Analysis:** Introduction, Limit analysis of steel structures, Mechanical properties of structural steel, Plastic hinge, Moment curvature relations, Limit load, Coplanar load, Upper lower bound theorems. Redistribution of moments continuous beams: Relevant or irrelevant mechanisms, Types of mechanisms method for performing moment check. Portal frame, Mechanisms, Combination of mechanisms, Moment check, Partial complete and over complete collapse.

**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 end bending stress, connections.

**Analysis of Communication Towers:** Analysis of Transmission line Towers: Loads on towers, Sag (dip) and Tension in uniformly loaded conductors, Analysis of towers (analysis as coplanar assembly), Design of members in towers, Design of foundation of towers. Design of Steel Chimneys for wind and gravity loads. Design of gantry girder.

TEXT BOOKS:

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

REFERENCE BOOKS:

3. “Design of Steel Structures” Vol2 by Dr.Rama Chandra, Scientific Publications
DESIGN OF STEEL BRIDGES

<table>
<thead>
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<th>4 Periods</th>
<th>Sessionals</th>
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</table>

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

**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.
3. Analyze and design of truss girder Bridges.

**SYLLABUS**

**Steel Bridges:** Introduction, classification of steel bridges, economical span, clearance requirements, dimensions of rolling stock, width of roadway and footway

**Loads:** Live load for Railway, Highway and combined rail cum road bridges, Impact effect, wind load, lateral force (racking force), longitudinal forces, centrifugal forces, seismic forces, temperature effects.

Plate girder bridges: Introduction, types, general arrangement, wind load effects, analysis and design of Deck type plate girder bridge for railways, analysis and design of Half-through plate girder bridge for railways, analysis and design of Through type plate girder bridge for railways.

Truss girder bridges: Introduction, general arrangement of components of truss girder bridge, self-weight of Truss girder bridge, wind load and wind effects, analysis of portal bracing, analysis and design of through type truss girder bridge

Bearings: Introduction, IS code requirements for bearings, Types of bearings, plate bearing, Rocker bearing, Roller bearing, Knuckle pin bearing, Railway board roller bearing

**TEXT BOOKS:**
1. Design of Steel structures by N. Subramanian, Oxford University Press.

**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
### INELASTIC DESIGN OF SLABS

<table>
<thead>
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<th>Theory</th>
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<tr>
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</table>

#### COURSE OBJECTIVES:

1. To know elastic theory analysis.
2. To know the yield line theory.
3. To analyze the slabs by principle of virtual work.
4. To analyze the slabs by using equilibrium method.
5. To design the slabs for different edge conditions.

#### COURSE OUTCOMES:

After completion of course students should be able to
1. Understand the elastic theory analysis.
2. Understand the yield line theory.
3. Analyze the slabs by principle of virtual work.
4. Analyze the slabs by using equilibrium method.
5. Design the slabs for different edge conditions.

#### SYLLABUS

**Basic elastic theory Analysis:** Classical plate theory, Lagrange’s equation, moment-deformation, shear-deformation relationships. Examples on square and rectangular plates carrying uniformly distributed load for different edge conditions.

**Principles of yield line theory:** slab reinforcement, section behavior and conditions at ultimate load. Yield lines as axes of rotation and basic rules for the determination of the pattern of yield lines. Different yield line patterns for rectangular and non rectangular slabs supported on three and four sides with different edge conditions.

**Analysis by principle of virtual work:** Derivation of virtual work equations for Isotropic and Orthotropic two-way Square/ Rectangular slabs supported on four sides for different edge conditions.

Analysis of rectangular/Square slabs supported on three sides with different edge conditions and one edge is free (Balcony slabs) using virtual work principle.

Analysis of rectangular/Square slabs supported on three (Balcony slabs) and four sides with different edge conditions using equilibrium method.

Design of rectangular/Square slabs supported on three (Balcony slabs) and four sides for different edge conditions.

Derivation of virtual work equations only, for two-way slabs supported on four sides with different edge conditions having openings at centre, central eccentric, corner, central short side and central long side.
TEXT BOOKS:


REFERENCE BOOK:

REPAIR AND REHABILITATION OF STRUCTURES
(VIVA-VOCE)

Tutorial : 3 Periods
Exam : 3 Hrs.

Sessionals : 50
Ext. Marks : 50
Credits : 2

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


Techniques to Test the Existing Strengths: Destructive and non-destructive tests on concrete.

Repairs of Multi-storey Structures: Cracks in concrete, Possible damages to the structural element beams, Slab, Column, Footing, etc., Repairing techniques like Jack Chu, Grouting, External pre-stressing, Use of chemical admixtures, Repairs to the fire damaged structure.

Repairs to Masonry Structures & Temples: Damages to masonry structures – Repairing techniques, Damages to temples – Repairing techniques.


Temporary Structures: Need for temporary structures under any Hazard, Various temporary structures, Case-studies.

Case Studies: At least 2 case studies per each student.

REFERENCE BOOKS:
ADVANCED DESIGN OF STRUCTURES  
(VIVA-VOCE)

<table>
<thead>
<tr>
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<th>3 Periods</th>
<th>Sessionals</th>
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</tbody>
</table>

COURSE OBJECTIVES:

1. To Design of blast resistant structures.
2. To Design of berth structures.
3. To Design of Quay Walls.
4. To analyze & design of Pre-engineered buildings.
5. To analyze & design Bow string girder bridge.
6. To analyze & design balanced cantilever bridge.
7. To analyze & design Raft design.
8. To Design of Piles and pile caps.

COURSE OUTCOMES:

After completion of course students should be able to

1. Design of blast resistant structures, Design of berth structures, Design of Quay Walls, Analyze & design of Pre-engineered buildings, Analyze & design Bow string Girder Bridge, Analyze & design balanced cantilever bridge, Analyze & design Raft design, Design of Piles and pile caps.

SYLLABUS

On any THREE of the following:

1. Design of blast resistant structures
2. Design of berth structures
3. Design of Quay Walls
4. Pre-engineered buildings
5. Bow string girder bridge
6. Balanced cantilever bridge
7. Raft design
8. Design of Piles and pile caps

REFERENCE BOOKS:

4. “Bridge Engineering ” by R.Rangwala, Charotar publishing House Pvt. Ltd
DEPARTMENT OF CIVIL ENGINEERING
M.TECH (STRUCTURAL ENGINEERING)

Scheme of Instruction and Examination
(Regulation:R16)

(with effect from 2016-2017 admitted batch onwards)

III SEMESTER

<table>
<thead>
<tr>
<th>Code No</th>
<th>Course title</th>
<th>Credits</th>
<th>Scheme of Examination</th>
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<td>10</td>
<td>Review</td>
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</table>

1. Candidates can do their thesis 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.

2. The Thesis Work -Preliminary 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, External Examiner, PG coordinator and guide. The marks shall be awarded in the ratio of 20, 40, 20 and 20 percent by the members respectively.
DEPARTMENT OF CIVIL ENGINEERING
M.TECH (STRUCTURAL ENGINEERING)

Scheme of Instruction and Examination
(Regulation: R16)

(with effect from 2016-2017 admitted batch onwards)

IV SEMESTER

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<th>Scheme of Examination</th>
<th>Exam Marks</th>
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<td>Thesis Work- Final</td>
<td>14</td>
<td>Viva-voce</td>
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</tr>
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</table>

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

2. The Thesis should be submitted at the end of 4th semester and it will be evaluated through Viva–Voce examination by a committee consisting of Head of the Department, External Examiner, PG coordinator and thesis guide. The marks shall be awarded in the ratio of 20, 40, 20 and 20 percent by the members respectively.
## I – SEMESTER

<table>
<thead>
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<th>Code No.</th>
<th>Course title</th>
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MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(Common for M.Tech (CST, IT))

Theory : 4 Periods  Sessionals : 30
Exam : 3 Hrs.  Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:
1. Presenting the theory of finite automata, as the first step towards learning advanced topics, such as compiler design.
2. Applying the concepts learned in fundamental courses such as Discrete Mathematics, in a theoretical setting; in particular, the application of proof techniques.
3. Discussing the applications of finite automata towards text processing.
4. Developing an understanding of computation through Turing Machines.

COURSE OUTCOMES:
1. Critical, logical-mathematical reasoning
2. Ability to apply mathematical knowledge and logic in solving problems.
3. Understanding of formal grammar analysis and compilation.

SYLLABUS
Mathematical notions of sets, sequences and tuples, functions and relations, Primitive recursive functions, computable functions, examples, graphs, strings and languages.

Boolean logic – properties and representation, theorems and types of proofs, deductive, inductive, by construction, contradiction and counter-examples.

Introduction to Number theory, Divisibility, modular arithmetic (addition modulo and multiplication modulo); Statements and applications of Euler and Fermat Theorems, Primitive Roots, Discrete Logarithms, Primality Test, Finding Large primes, Definition of Elliptic Curves and their applications to Cryptography.

Introduction To Finite Automata: Alphabets and languages- Deterministic Finite Automata – Non- deterministic Finite Automata – Equivalence of Deterministic and Non-Finite Automata – Languages Accepted by Finite Automata – Finite Automata and Regular Expressions – Properties of Regular sets & Regular Languages and their applications.


Turing Machines: The Definition of Turing Machine – Computing with Turing Machines – Combining Turing Machines, , programming techniques for Turing Machines,

Variants of Turing Machines, Restricted Turing Machines Universal Turing Machines. The Halting Problem, Decidable & undecidable problems- Post Correspondence Problems.
TEXT BOOKS:
1. Introduction to Automata Theory, Languages and Computations – J.E. Hopcroft, & J.D. Ullman, Pearson Education Asia.

REFERENCE BOOKS:
1. Introduction to languages and theory of computation – John C. Martin (MGH)
3. Introduction to Theory of Computation – Michael Sipser (Thomson Nrools/Cole)
DATA STRUCTURES & ALGORITHMS
(Common for M.Tech (CST, IT))

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:
1. Student will learn about advanced data structures and the algorithms for manipulating them, and how to analyze the time and memory requirements of them.
2. 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.
3. Student will learn when and how to use techniques for developing algorithms, such as divide-and-conquer and dynamic programming.
4. Student will also become skilled in algorithmic analysis and algorithm development using the latest techniques.

COURSE OUTCOMES:
1. 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 and how they are implemented in ‘C’ programming language.

SYLLABUS

Algorithm Analysis: Overview of C++ classes, pointers, parameters passing, templates, using Matrices, Basics of time complexity estimates, General norms for running time calculation

Lists, Stacks & Queues: Abstract Data Types, Representation & implementation of ADT list, Doubly linked list, Circular linked lists, Representation, Implementation and applications of ADT stack and Queue.


Hashing: Hash Function, Separate chains, Open addressing, rehashing, Extendible Hashing.

Internal Sorting Algorithms: Sorting like insertion Sort, shell Sort, Heap Sort, Merge Sort, Quick Sort and Simple external Sorting algorithm.

Disjoint Set: Equivalence Relations, Find and Union algorithms an dynamic sets, Path compression and Union-by-Rank algorithm analysis.


TEXT BOOK:
REFERENCE BOOKS:

COURSE OBJECTIVES:
1. To interpret an entity relationship diagram (ERD) to express requirements and
demonstrate skills to model data requirements and create data models into normalized
designs
2. To use SQL to create database objects, populate tables, and retrieve data
3. To describe the causes of performance problems and how to improve database application
performance
4. To develop a working understanding of database systems theory in order to apply that
knowledge to any particular database implementation.

COURSE OUTCOMES:
1. Understanding of DBMS.
2. Design database using ER model and refine the design by enforcing functional
dependencies, integrity constraints and normalization
3. Write queries using SQL
4. Implement procedures and triggers

SYLLABUS

Database Systems: Introduction to the Database Systems, Concepts of Relational Models
and Relational Algebra. SQL: Introduction to SQL Queries, Integrity Constraints, Joins,
Views, Intermediate and Advanced SQL features and Triggers.

Database Design: Overview of the Design process, E-R Models, Functional dependencies
and other kinds of dependencies, Normal forms, Normalization and Schema Refinement.

Database Application Design and Development: User Interfaces and Tools, Embedded
SQL, Dynamic SQL, Cursors and Stored procedures, JDBC, Security and Authorization in
SQL, Internet Applications.

Query Evaluation: Overview, Query processing, Query optimization, Performance Tuning.

Database System Architectures: Centralized and Client-Server Architecture, Server system
Architecture, Parallel and Distributed database, Object based databases and XML. Advanced
data types in databases. Cloud based data storage systems.

Transaction Management: Overview of Transaction Management, Transactions,
Concurrency control, Recovery systems, Advanced Transaction Processing.

Case Studies: Postgre SQL, Oracle, IBM DB2 Universal Database, Microsoft SQL Server.

TEXT BOOK:
1. Database System Concepts, Avi Silberschatz , Henry F. Korth , S. Sudarshan

REFERENCE BOOK:
ADVANCED OPERATING SYSTEMS
(Common for M.Tech (CST, IT))

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

COURSE OUTCOME:
1. Students understands the concept of Distributed systems, Process Synchronization, File structure and shared memory in Duplicates operating systems

SYLLABUS


Distributed Systems & Synchronization: Clock Synchronization, Logical Clocks, Mutual Exclusion, Global Positioning Of Nodes, Data-Centric Consistency Models, Client-Centric Consistency Models, Consistency Protocols.


TEXT BOOKS:
REFERENCE BOOKS:
COMPUTER ORGANIZATION AND ARCHITECTURE

Code: M16 CST 1105

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:
1. To have a thorough understanding of the basic structure and operation of a digital computer.
2. To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-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 memories and virtual memory.

COURSE OUTCOMES:
Students will have thorough knowledge about
1. Basic structure of a digital computer
2. The organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.

SYLLABUS

Register Transfer and Micro operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

Micro programmed Control: Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC)

Input/output Organization: Peripheral Devices, I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor (IOP), Serial Communication.

Memory Organization: Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory, Memory Management Hardware.

TEXT BOOKS:

REFERENCE BOOKS:
E-COMMERCE

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:
1. To understand process models,
2. E– payments
3. Credit Cards and smart cards
4. E-. documents and E- Business logic

COURSE OUTCOMES:
1. Will be able to analyze the concept of electronic market and market place.
2. Able to understand the business standards and security issues
3. Able understand e-commerce business models and applications, issues of e-commerce business models.

SYLLABUS


Electronic Payment Systems – Types of Electronic Payment Systems, Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment Systems, Designing Electronic Payment Systems Electronic Data Inter Change, Inter Organizational Commerce - EDI, EDI Implementation, Value Added Networks.


Business to consumer e-commerce: On line Marketing and Selling, Information Goods, Electronic Markets and Auctions on the Internet

E-Business Intelligence: Data Mining, Web Merchandising and Recommender Systems, Intelligent Agents in e-commerce, Business-to-Business e-commerce and Supply Chain Management

Security of Internet Hosts and Networks, Public Key Infrastructure, Safety of e-commerce Applications.
TEXT BOOK:

REFERENCE BOOKS:
EMBEDDED SYSTEMS

Theory : 4 Periods  
Exam : 3 Hrs.  
Sessionals : 30  
Ext. Marks : 70  
Credits : 4

COURSE OBJECTIVES:
1. To understand the architecture embedded systems
2. To know Embedded system software design
3. Design, execution and evaluation of experiments on embedded platforms.
4. Analysis, design and testing of systems that include both hardware and software.
5. Identification and synthesis of solutions for embedded system problems

COURSE OUTCOMES:
1. An ability to design systems, components, or processes for broadly-defined engineering technology problems.
2. Implement combinatorial logic and sequential systems in terms of basic digital building blocks using simulation software. You will be able to perform some optimisations.
3. Design, test and critically evaluate embedded solutions to real world situations using digital components (sequential and combinatorial).
4. Recognize the key features of embedded systems in terms of computer hardware and be able to discuss their functions. You will be aware of the key factors affecting computing hardware evolution.
5. Develop software systems for embedded devices using assembler code

SYLLABUS


Tasks and Task States – Tasks and Data – Semaphores and Shared Data – Semaphore Problems – Semaphore variants.


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:

REFERENCE BOOK:
COURSE OBJECTIVES:

1. The course objectives include: overview of digital image processing field; understand the fundamental digital image processing algorithms and implementation; gain experience in applying image processing algorithms to real problems.
2. Cover the basic theory and algorithms that are widely used in digital image processing.
3. 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, and their use in frequency domain filtering.
4. Demonstrated understanding of the fundamental image enhancement algorithms such as histogram modification, contrast manipulation, and edge detection.

SYLLABUS


Image Transforms: A Detail Discussion On Fourier Transform, DFT, FFT, Properties WALSH Transform, WFT, HADAMARD Transform, DCT

Image Enhancement:

a. Arithmetic and Logical Operations, Pixel or Point Operations, Size Operations,
b. Smoothing Filters-Mean, Median, Mode Filters – Comparative Study
c. Edge Enhancement Filters – Directorial Filters, Sobel, Laplacian, Robert, KIRSCH Homogeneity
d. DIFF Filters, Prewitt Filter, Contrast Based Edge Enhancement Techniques – Comparative Study
e. Low Pass Filters, High Pass Filters, Sharpening Filters. – Comparative Study
f. Colour Fundamentals and Colour Models
g. Colour Image Processing.

**Image Compression:** Run Length Encoding, Contour Coding, Huffman Code, Compression Due to Change in Domain, Compression Due to Quantization Compression at the Time of Image Transmission. Brief Discussion on:- Image Compression Standards.

**Image Segmentation:** Characteristics of Segmentation, Detection of Discontinuities, Thresholding Pixel Based Segmentation Method. Region Based Segmentation Methods, Segmentation by Pixel Aggregation, Segmentation by Sub Region Aggregation, Histogram Based Segmentation, Split and Merge Technique, Motion in Segmentation

**Morphology:** Dilation, Erosion, Opening, Closing, Hit-And-Miss Transform, Boundary Extraction, Region Filling, Connected Components, Thinning, Thickening, Skeletons, Pruning Extensions to Gray – Scale Images Application of Morphology in LP

**Image, Video & Multimedia Communications:** Multi-scale and multi-orientation representation; Geometry and texture representation; Object based representation; Hierarchical representation; Sparse representation, Multimedia with image and video content; Multimedia event synchronization

**TEXT BOOK:**

1. Digital Image Processing, Rafael C. Gonzalez And Richard E. Woods, Addision Wesley

**REFERENCE BOOKS:**

COMPUTER NETWORKS

| Theory     | : 4 Periods | Sessionals : 30 |
| Exam       | : 3 Hrs.    | Ext. Marks : 70 |
| Credits    | : 4         |

COURSE OBJECTIVES:
1. Build an understanding of the fundamental concepts of computer networking.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
3. Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
4. Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual 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. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
4. Identify the different types of network devices and their functions within a network
5. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.
6. Have an understanding of protocols in computer networks
7. Understand different protocols of different layers of computer networks.

SYLLABUS


Data Communications: Transmission Media, Wireless Transmission, Multiplexing, Switching, Transmission in ISDN, Broad Band ISDN, ATM Networks
Data Link Control, Error Detection & Correction, Sliding Window Protocols, LANs & MANs: IEEE Standards for LANs & MANs-IEEE Standards 802.2, 802.3, 802.4, 802.5, 802.6, High Speed LANs.


Network Devices: Over View of Repeaters, Bridges, Routers, Gateways, Multiprotocol Routers, Brouters, Hubs, Switches, Modems, Channel Service Unit CSU, Data Service Units DSU, NIC, Wireless Access Points, Transceivers, Firewalls, Proxies.

**TEXT BOOK:**

**REFERENCE BOOKS:**
2. Computer networks, Mayank Dave, CENGAGE.
CLOUD COMPUTING

Theory : 4 Periods
Exam : 3 Hrs.

Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:
1. To impart fundamental concepts in the area of cloud computing.
2. To impart knowledge in applications of cloud computing.

COURSE OUTCOMES:
1. Understanding the systems, protocols and mechanisms to support cloud computing
2. Develop applications for cloud computing
3. Understanding the hardware necessary for cloud computing
4. Design and implement a novel cloud computing application

SYLLABUS


Software as a Service - Overview, Driving Forces, Company Offerings, Industries Software plus Services - Overview, Mobile Device Integration, Providers, Microsoft Online.

Developing Applications - Google, Microsoft, Intuit QuickBase, Cast Iron Cloud, Bungee Connect, Development, Troubleshooting, Application Management.

Local Clouds and Thin Clients - Virtualization in Your Organization, Server Solutions, Thin Clients, Case Study: McNeilus Steel.


TEXT BOOK:

REFERENCE BOOK:
GRID COMPUTING

COURSE OBJECTIVES:
1. Understand the need for and evolution of Grids in the context of processor- and data-intensive applications
2. Be familiar with the fundamental components of Grid environments, such as authentication, authorization, resource access, and resource discovery
3. Know architecture of grid computing
4. Be able to justify the applicability, or non-applicability, of Grid technologies for a specific application

COURSE OUTCOMES:
1. To understand the genesis of grid computing
2. To know the application of grid computing
3. To learn the technology and tool kits for facilitating grid computing

SYLLABUS


Architecture: Architecture of Grid and Grid Computing, Review of Web Services-OGSA-WSRF.


Grid Middleware: List of globally available Middlewares - Case Studies-Recent version of Globus Toolkit and gLite - Architecture, Components and Features.


TEXT BOOKS:
REFERENCE BOOKS:

2. Grid Computing: Making the Global Infrastructure a reality, Fran Berman, Geoffrey Fox, Anthony J.G. Hey, John Wiley and sons
COMPUTER GRAPHICS & VISUAL COMPUTING

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:

1. To Learn basic and fundamental computer graphics techniques
2. To Learn image synthesis techniques
3. Examine applications of modeling, design and visualization
4. Learn different color modeling and computer animation
5. Learn hierarchical modeling and graphing file formats
6. Learn viewing pipeline and structures
7. To Learn visualization and computational and mathematical methods of visual computing
8. To understand visual transformation and projection

COURSE OUTCOMES:

Students able to
1. Learn basic and fundamental computer graphics techniques
2. Represent and implement images and objects using 3D representation.
3. Design develop surface detection using various detection methods
4. Choose various illumination models for provides effective standards of objects
5. Design of develop effective computer animations
6. Design of various projections

SYLLABUS


Three Dimensional Concepts and Object representations: 3D display methods-3D Graphics, Polygon Surfaces, Curved Lines and Surfaces, Quadratic Surfaces, Super Quadrics, Blobby Objects, Spline Representations, Cubic Spline methods, Bézier Curves and Surfaces, B Spline Curves and Surfaces

Viewing Pipeline and structures: Viewing Coordinates, Projections, View Volumes, General Projection Transformations, Clipping, Hardware Implementations, Concepts of Structures and Basic models, Editing, Hierarchical Modeling with Structures

Visualization: Three Dimensional Viewing, Visualization-Image Processing- The viewing Pipeline, Viewing Coordinate Reference Frame, Window-to-Viewport Coordinate Transformation, Two Dimensional Viewing Functions, Clipping Operations, Point Clipping, Line Clipping, Polygon Clipping-Curve Clipping, Text and Exterior Clipping.

Visual Computing: Computational and mathematical methods for creating, capturing, analyzing and manipulating digital photographs, Introductory Topics on computer graphics, computer vision, and machine learning. Programming assignments intended to give hands-on experience with creating graphical user interfaces, and with implementing programs for synthesizing and manipulating photographs.


TEXT BOOKS:

REFERENCE BOOKS:
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.

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

SYLLABUS
Implementation of Data Structures and Algorithms using C++
1. To perform various operations such as insertion, deletion, display on single linked lists.
2. To implement
   (i) Stacks using linked list.   (ii) Queues using linked list.
3. To perform different types of searching techniques on a given list
   (i) Sequential search  (ii) Binary search  (iii) Fibonacci search
4. To perform different types of sortings on a given list
   (i) Bubble sort    (ii) Insertion sort  (iii) Selection sort  (iv) Merge sort
5. To perform different types of sortings on a given list
   (i) Quick sort    (ii) Shell sort  (iii) Radix sort
6. To perform the following
   (i) To convert the given infix expression to postfix expression
   (ii) To evaluate the given postfix expression.
7. To perform various operations on graphs
   (i) Vertex insertion. (ii) Vertex deletion.
   (iii) Edge insertion. (iv) Edge deletion.
   (v) Breadth First traversal. (vi) Depth First traversal.
8. To implement dictionaries using hashing technique
9. To perform various operations on binary heap.
10. To perform various operations on Binary search tree.
11. To perform operations on AVL trees.
12. To perform various operations on B-tree.
REFERENCE BOOKS:

DATA BASE MANAGEMENT LAB
(Common for M.Tech (CST, IT))

Lab : 3 Periods
Exam : 3 Hrs.

Sessionals : 50
Ext. Marks : 50
Credits : 2

COURSE OBJECTIVES:
1. To practice SQL and PL/SQL in different commercial DBMS packages
2. Learn to design DBMS projects
3. Practice implementing DBMS projects

COURSE OUTCOMES:
1. Able to design DBMS projects including Normalization
2. Able to implement a DBMS project with appropriate triggers, procedures and front end.

SYLLABUS

Accessing the Database: The first laboratory exercise is to connect to a database, populate it with data, and run very simple SQL queries. (Data Definition, Table Creation, Constraints, Insert, Select Commands, Update & Delete Commands.)

Basic SQL: This lab covers simple SQL queries. (Inbuilt functions in RDBMS).

Intermediate SQL: This lab covers more complex SQL queries. (Nested Queries & Join Queries, Control structures)

Advanced SQL: This lab covers even more complex SQL queries. (Procedures and Functions, .PL/SQL, Cursors and Triggers)

Database Access from a Programming Language: This lab introduces you to database access from a programming language such as Java or C#. Although phrased using Java/JDBC, the exercise can be done using other languages, OBDC or ADO.NET APIs.

Building Web Applications: This lab introduces you to construction of Web applications. Although phrased using the Java Servlet API, the exercise can be done using other languages such as C# or PHP.

Project: Each student is assigned with a problem. The student is to develop a logical and physical database design for the problem and develop Forms, Menu design and Reports.

A. The logical design performs the following tasks:
   a) Map the ER/EER diagrams to a relational schema. Be sure to underline all primary keys, include all necessary foreign keys and indicate referential integrity constraints.
   b) Identify the functional dependencies in each relation
   c) Normalize to the highest normal form possible

B. Perform physical design based above logical design using Oracle/MSSQL on Windows platform and MySQL/PostgreSQL on Linux platform.

Sample Term Projects
1. Retailer database
2. Automobile sales database
3. Electronics vendor database
4. Package delivery database
5. Real estate database
REFERENCE BOOKS:

2. ORACLE PL/SQL by example. Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rd Edition
3. ORACLE Database Log PL/SQL Programming Scott Urman, TMG Hill.
4. SQL & PL/SQL for Oracle 10g, Black Book, Dr.P.S. Deshpande.
## II – SEMESTER

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ARTIFICIAL INTELLIGENCE

Theory : 4 Periods
Exam : 3 Hrs.

Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:
1. To introduce different artificial intelligence techniques
2. To learn different machine learning algorithms
3. Learn different recent algorithms in artificial intelligence

COURSE OUTCOMES:
1. Able to learn artificial intelligence techniques
2. Understand the concept of machine learning.

SYLLABUS


Machine Learning: Knowledge and Learning, Learning by Advise, Examples, Learning in problem Solving, Symbol Based Learning, Explanation Based Learning, Version Space, ID3 Decision Based Induction Algorithm, Unsupervised Learning, Reinforcement Learning, Supervised Learning: Perceptron Learning, Back propagation Learning, Competitive Learning, Hebbian Learning.
Natural Language Processing: Role of Knowledge in Language Understanding, Approaches Natural Language Understanding, Steps in The Natural Language Processing, Syntactic Processing and Augmented Transition Nets, Semantic Analysis, NLP Understanding Systems; Planning: Components of a Planning System, Goal Stack Planning, Hierarchical Planning, Reactive Systems

TEXT BOOKS:

1. Artificial Intelligence, George F Luger, Pearson Education Publications

REFERENCE BOOKS:

1. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI
3. Artificial Intelligence : A modern Approach, Russell and Norvig, Printice Hall
OBJECT ORIENTED SOFTWARE ENGINEERING
(Common for M.Tech (CST, IT))

Theory : 4 Periods  Sessionals : 30
Exam : 3 Hrs.  Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:
1. Students will learn the importance of following a process that is driven by the requirements of the users of the system.
2. Showing how we apply the process of object-oriented analysis and design to software development.
3. Pointing out the importance and function of each UML model throughout the process of object oriented analysis and design and explaining the notation of various elements in these models.
4. Providing students with the necessary knowledge and skills in using object-oriented CASE tools

COURSE OUTCOMES:
1. Relate object oriented concepts representation through artifacts of UML.
2. Build and relate classes, their relationships and collaborations (CRC) (for any case study).
3. Generate the list and order of activities carried out for each behavior exhibited by any system
4. Design advanced behavioral concepts to deploy the model
5. Apply the project development activities of software engineering

SYLLABUS

Introduction to Object Oriented Software Engineering

Requirements Engineering: Domain Analysis, Problem Definition And Scope, Requirements Definition, Types Of Requirements, Techniques For Gathering And Analyzing Requirements, Requirement Documents, Reviewing, Managing Change In Requirements.


Case Study:
   a. Simple Chat Instant Messaging System
   b. GPS Based Automobile Navigation System
   c. Waste Management Inspection Tracking System (WMITS)
   d. Geographical Information System

TEXT BOOK:
1. Object-Oriented Software Engineering Practical software development using UML and Java by Timothy C. Lethbridge & Robert, Langaniere Mcgraw-Hill

REFERENCE BOOKS:
COMPILER DESIGN

Theory : 4 Periods
Exam : 3 Hrs.

Sessionals : 30
Ext. Marks : 70
Credits : 4

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 learn the new code optimization techniques to improve the performance of a program in terms of speed & space.
3. To use the knowledge of patterns, tokens & regular expressions

SYLLABUS


**Code Generation**: Issues in Code Generation, Input to Code Generator, Instruction Selection, Register Allocation, Simple Target Machine Model, Program and Instruction Costs, Register allocation & Assignments, Code Generation Algorithm, Code Generators, Optimal Code Generation for Expressions, Code Generation From DAG.

**Symbol Table Management**, Contents of a Symbol Table, Data Structures for Symbol Tables; Run time Environments, Implementation of a simple Stack allocation, Heap Management, Block Structured Languages; Error Detection & Recovery, Lexical Phase Errors, Syntactic & Semantic Errors, Error Handling Routines.

**Code Scheduling & Case Studies**: Instruction Scheduling, Speculative Loads & Boosting, Speculative Scheduling, Software Pipe Lining, Trace Scheduling, Percolation Scheduling, Case Studies: Sun Compilers, SPARC, IBM XL Compiler for the POWER& Power PC , Digital Equipment Compiler for Alpha, Intel Reference Compilers, Future Trends In Compiler Design and Implementations.

**TEXT BOOKS:**

2. Advanced Compiler Design and Implementation, Steven Muchnic, Elsevier Publications

**REFERENCE BOOKS:**

DATA WAREHOUSING AND DATA MINING

Theory : 4 Periods  Sessionals : 30
Exam : 3 Hrs.  Ext. Marks : 70
Credits : 4

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 analyze different operations and techniques involved in data mining.

SYLLABUS

Introduction to Data Mining: Evolution of IT into DBMS, Motivation and importance of Data Warehousing and Data Mining, Kinds of Patterns, Technologies, Basic Data Analytics: Data Objects and Attributes Types, Statistical Descriptions of Data, Data Visualization, Estimating Data Similarity and Dissimilarity, Major Issues in Data Mining., Data Mining Applications

Data Warehouse and OLAP Technology: Basic Concepts of Data warehouse, Data Modeling using Cubes and OLAP, DWH Design and usage, Implementation using Data Cubes and OLAPs, Data Generalization with AOI.

Data Mining Primitives & Data Cubes: Data Mining Primitives, Data Mining Tasks, Data Mining Query Language, Designing Graphical user Interfaces based on a Data Mining Query language, Preliminary Concepts of Data Cube Computation, Data Cube Computation Methods: Multi-way Array Aggregation for Full Cube, BUC Computing for Iceberg Cubes, Star-Cubing Using Dynamic Star-Tree Structure, Pre-computing Shell Fragments for Fast High-Dimensional OLAPs.

Data Mining Concept Description: Data Preprocessing: Pre-processing the Data, Data Cleaning, Data Integration, Data Reduction, Data Transformation, Discretization and Concept Hierarchy Generation; Data Architectures of Data Mining Systems; Characterization and Comparison, Concept Description, Data Generalization and Summarization; Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons, Discriminating between Different Classes, Mining Descriptive & Statistical Measures in Large Databases.

Mining Frequent Patterns Based on Associations and Correlations: Basic Concepts, Frequent Itemset Mining Methods: Apriori Algorithm, Association Rule Generation, Improvements to A Priori, FP-Growth Approach, Mining Frequent Patterns using Vertical Data Formats, Mining Closed and Max Patterns, Pattern Evaluation Methods
**Classification:** Basic Concepts, Decision Tree Induction, Bayes Classification, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy Advanced Methods: Classification by Back Propagation, SVM, Associative Classification, Lazy Learning, Fuzzy Sets, Rough Sets, Genetic Algorithms, Multiclass Classification, Semi-Supervised Classification

**Cluster Analysis:** Basic Concepts, Types of Data in Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Evaluation of Clustering Solutions

**TEXT BOOK:**

1. Data Mining- Concepts and Techniques by Jiawei Han, Micheline Kamber and Jian Pei – Morgan Kaufmann publishers – 3rd edition

**REFERENCE BOOKS:**

1. Data Mining Techniques, A.K.Pujari, University Press Data mining concepts by Tan, Steinbech, and Vipin Kumar - Pearson Edu publishers
2. Data Mining – Introductory and Advanced by Margarett Dunham - Pearson Education publishers
3. Data Warehousing for Real – world by Sam Annahory - Pearson Education publishers
PARALLEL PROGRAMMING

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks : 70
Credits : 4

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.
4. Analytical modeling and performance of parallel programs.
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 and implement them on available parallel computer systems.
3. Reconstruction of emerging parallel algorithms with MPI.
4. Compute contemporary parallel algorithms.

SYLLABUS

Introduction to Parallel Computing: Parallel Programming and Parallel Computing, Overview of Parallel Architectures and Parallel Programming Models, MIMD and SPMD Models, Problems Unique to Parallel Programming.

Supercomputers and Grand Challenge Problems: Modern Parallel Computers, Data Dependence Graph, Data Parallelism, Functional Parallelism, Pipelining and Data Clustering.

Interconnection Networks: Switch Network Topologies, Direct and Indirect Network Topology, Bus, Star, Ring, Mesh, Tree, Binary Tree Network, Hyper Tree Network, Hybrid, Hypercube, Perfect Shu E Network, Torus and Butterfly Network.


Introduction to Parallel Algorithms: Parallel Programming Models, PVM, MPI Paradigms.

Parallel Programming Languages: Brents Theorem, Simple Parallel Programs in MPI Environments, Parallel Algorithms on Network, Addition of Matrices, Multiplication of Matrices.

TEXT BOOKS:
REFERENCE BOOKS:
1. Introduction to Distributed and Parallel Computing, Crichlow, PHI.
3. Introduction to Parallel Processing, Shashi Kumar M et al., PHI New Delhi.
5. The Design and Analysis of Parallel Algorithms, S.G. Akl, PHI.
SEMANTIC WEB

Theory : 4 Periods
Exam : 3 Hrs.

Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:
1. To teach the concepts, technologies and techniques underlying and making up the Semantic Web.
2. Understand and use ontologies in the context of Computer Science and the semantic web.

COURSE OUTCOMES:
1. Able to understand the rationale behind Semantic web.
2. Understand the concept structure of the semantic web technology and how this technology revolutionizes the World Wide Web and its uses.
3. Able to model and query domain knowledge as ontologies defined using standards such as RDF and OWL.

SYLLABUS


Ontology Query Languages: Semantic Web Query Languages and Implementations, ROPS ( RDF OWL Processing Systems), SWOPS ( SWRL Ontology Processing System, Bench Marking Results, SPARQL, Query Languages for RDF, Conjunctive Queries for OWL DL).

Semantic Web Mining: Introduction, Concepts in Semantic Web Mining, XML, RDF & Web Data Mining, Ontologies and Web Data Mining, Agents in Web Data Mining, Web Mining and Semantic Web As a Data Base, semantic Interoperability and Web Mining Web Mining Vs Semantic Web Mining.
Semantic Web Tools & Applications: Web Data Exchange and Syndication, Semantic WIKI’s, Semantic Portals, Semantic Meta Data in Data formats, Semantic Web Services Modeling Ontologies, Semantic Web Service Design Tools, Ontologies for Standardizations WMO and SWMO Applications

TEXT BOOK:


REFERENCE BOOKS:

1. Web Data Mining and Applications in Business Intelligence and Counter Terrorism, Bavani Thuraisingham, CRC Press, June 2003
2. Implementing Semantic Web Services-The SESA Frame Work, D. Fensel; M. Kerrigan; M. Zaremba, Springer
3. Enabling Semantic Web Services- The Web Service Modeling Ontology, Fensel, D; Lausen, H; Pollers, A; Bruijn, J; Stollberg, M; Springer
BIG DATA ANALYTICS

Theory : 4 Periods  
Exam : 3 Hrs.  
Sessionals : 30  
Ext. Marks : 70  
Credits : 4

COURSE OBJECTIVES:
1. To provide advanced knowledge and skills in the field of Computer Science and Engineering.
2. Capable to quickly adapt to new technology in the field of Big Data, assimilate new information, and solve real world problems.
3. To pursue applied research in the advance field of computer science and be committed to life-long learning activities.

COURSE OUTCOMES:
1. To be able to apply the knowledge of computing tools and techniques in the field of Big Data for solving real world problems encountered in the Software Industries.
2. To be able to analyze the various technologies & tools associated with Big Data.
3. To be able to identify the challenges in Big Data with respect to IT Industry and pursue quality research in this field with social relevance.

SYLLABUS

Introduction: Velocity, Variety, Veracity; Drivers for Big Data, Sophisticated Consumers, Automation, Monetization, Big Data Analytics Applications: Social Media Command Center, Product Knowledge Hub, Infrastructure and Operations Studies, Product Selection, Design and Engineering, Location-Based Services, Online Advertising, Risk Management

Architecture Components: Massively Parallel Processing (MPP) Platforms, Unstructured Data Analytics and Reporting: Search and Count, Context-Sensitive and Domain-Specific Searches, Categories and Ontology, Qualitative Comparisons, Data Privacy Protection, Real-Time Adaptive Analytics and Decision Engines

Advanced Analytics Platform: Real-Time Architecture for Conversations, Orchestration and Synthesis Using Analytics Engines, Entity Resolution, Model Management, Discovery Using Data at Rest, Integration Strategies

Implementation of Big Data Analytics: Revolutionary, Evolutionary, or Hybrid, Big Data Governance, Integrating Big Data with MDM, Evolving Maturity Levels


Communication Cost Models, Complexity Theory for Map-Reduce, Reducer Size and Replication Rate, Graph Model and Mapping Schemas, Lower Bounds on Replication Rate

Mining Data Streams: Stream Data Mode I and Management Stream Source, Stream Queries, and issues, Sampling Data in a Stream , Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Ones in a Window, Decaying Windows
**Link Analysis:** Page Ranking in web search engines, Efficient Computation of PageRank using Map-Reduce and other approaches, Topic-Sensitive PageRank, Link Spam, Hubs and Authorities

**TEXT BOOKS:**

1. Big Data Analytics: Disruptive Technologies for Changing the Game, Dr. Arvind Sathi, First Edition October 2012, IBM Corporation

**REFERENCE BOOKS:**

DATABASE SECURITY

COURSE OBJECTIVES:
1. To understand the basic concepts of database security.
2. To learn security issues and solutions.
3. To understand threats to learn how to perform data encryption.
4. To understand Enterprise Security Policy.

COURSE OUTCOMES:
1. Able to understand the database security framework.
2. Will be able to learn database access control.
3. Will be able to understand database security techniques.
4. Will be able to implement security for databases.

SYLLABUS


Database Auditing: Auditing Database Users, User Privileges And Objects: Monitoring for Suspicious Activity, Standard Database Auditing, Setting the AUDIT_TRAIL, Specifying Audit Options, Viewing Auditing Options, Auditing the SYSDBA Users, Audit to XML Files, Value-Based Auditing, Auditing DML Statements, Triggering Audit Events, Maintaining the Audit Trail.
**Database Privileges And Roles:** Authorization, Privileges, Benefits of Roles, Using Proxy Authentication With Roles, Creating An Enterprise Role, Securing Objects and Application Roles, Data Masking Primitives And Routines, Privacy in Location- Based Services

**Data Encryption For Database Security:** Problems Solved by Encryption, Storing the Key in Database, Key Management by User, Application-Based Encryption, Cipher Block Modes, Hash and Message Authentication Code, Transparent Data Encryption (TDE) & File Encryption Methods.

**TEXT BOOKS:**

**REFERENCE BOOKS:**
1. Database Security & Auditing By Hassan A Afyouni, Cengage Delmar Learning India Pvt, 2009
MOBILE COMPUTING

Theory : 4 Periods  
Exam : 3 Hrs.  
Sessionals : 30  
Ext. Marks : 70  
Credits : 4

COURSE OBJECTIVES:

1. Introduction of an advanced element of learning in the field of wireless communication.
2. 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.

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.

SYLLABUS


WLAN Topologies, WLAN Standard IEEE 802.11, Comparison Of IEEE 802.11a, B, G and N Standards, Wireless PANs, Hiper LAN, Wireless Local Loop, ATM, Virtual Private Networks, Wireless Data Services, Common Channel Signaling, Various Networks for Connecting to The Internet.


Communications Asymmetry, Classification of New Data Delivery Mechanisms, Push-Based Mechanisms, Pull-Based Mechanisms, Hybrid Mechanisms, Selective Tuning (Indexing) Techniques. CDMA, GSM , Wireless Data, 3GNetworks and Applications

TEXT BOOKS:

REFERENCE BOOKS:
SOFT COMPUTING

Code: M16 CST 1210

Theory : 4 Periods  Sessionals : 30
Exam : 3 Hrs.  Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:
1. Introduce students to soft computing concepts and techniques and foster their abilities in designing and implementing soft computing based solutions for real-world and engineering problems.
2. Explain the students about fuzzy sets and its operations,
3. Introduce students to fuzzy systems, fuzzy logic and its applications
4. Explain the students about Artificial Neural Networks and various categories of ANN.

COURSE OUTCOMES:
At the end of the course students
1. Able to understand genetic algorithm fundamentals and its operators and procedure
2. Understand artificial neural network model and its activation functions
3. Understand different operations of GA

SYLLABUS


Rough Set: Introduction, Imprecise Categories Approximations and Rough Sets, Reduction of Knowledge, Decision Tables and Applications.
**Hybrid Systems**: Neural-Network-Based Fuzzy Systems, Fuzzy Logic-Based Neural Networks, Genetic Algorithm for Neural Network Design and Learning, Fuzzy Logic and Genetic Algorithm for Optimization, Applications

**TEXT BOOKS:**

**REFERENCE BOOKS:**
1. Artificial Intelligence and Intelligent Systems, N.P.Padhy, Oxford University Press.
CLUSTER COMPUTING

Theory : 4 Periods
Exam : 3 Hrs.

Sessionals : 30
Ext. Marks : 70

Credits : 4

COURSE OBJECTIVES:
1. The course will provide an insight for achieving cost efficient high performance system.
2. The course will deal with design and architecture of cluster computing.

COURSE OUTCOMES:
At the end of the course student will
1. Have knowledge of virtual technologies and Service-oriented architecture,

SYLLABUS


Cluster Planning, Architecture, Node Hardware and Node Software, Design Decisions

Network Hardware: Internet technologies, Ethernet, cLAN, QsNet, Infiniband, Packet Format, NIC Architecture, hubs & Switches.


Clusters Management: Cluster Workload Management Activities, Queuing, scheduling and monitoring, Resource Management and Accounting

Virtualization technologies; Parallel and Virtual file systems, Introduction, Programming with parallel File systems, Benchmarks

TEXT BOOK:

REFERENCE BOOKS:
PERVASIVE COMPUTING

COURSE OBJECTIVES:
1. Student can understand underlying technologies and applied standards for building up pervasive solutions.
2. This includes WAP, GPRS, Bluetooth, Infrared, Voice over IP, among others.
3. Expose students to latest technologies that relate to device technologies and pervasive computing, such as wearable computing and smart identification.

COURSE OUTCOMES:
At the end of the course, students should be able to:
1. Identify distinguishing features of the different mobile device categories,
2. Understand the role of the Wireless Application Protocol in enabling mobile devices to access the Internet
3. Able to understand elementary to medium-level (complexity-wise) user interface applications for all three platforms.

SYLLABUS


Pervasive Architecture: Background, Scalability and Availability, Pervasive Web Application Architecture, Implementation Issues.

Pervasive Devices: Device Categories, Device Characteristics, Software Components in the Device, Information Access Devices, Smart Identification, and Embedded Controls, Hand Held Computers, Cellular Phones, Smart Phones, Smart Cards and Smart Appliances


Pervasive Synchronization: Definition of Synchronization, Models of Synchronization, Challenges in Synchronizing Data, Industry Data Synchronization Standards: Infrared Mobile Communications, WAP, Third Generation Partnership Program, Syncml, Synchronization Solutions


TEXT BOOKS:

1. Pervasive Computing: The Mobile World by Uwe Hansmann, Lothar Merk
2. Pervasive Computing: Technology And Architecture of Mobile Internet Applications Jochen Burkhardt, Horst Henn, Stefan Hepper, Klaus Rindtorff, Thomas Schaeck

REFERENCE BOOK:

DATA WAREHOUSING & MINING LAB

<table>
<thead>
<tr>
<th>Lab</th>
<th>Sessionals</th>
<th>Credits</th>
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<td>2</td>
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<tr>
<td>3 Hrs.</td>
<td>Ext. Marks</td>
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</table>

COURSE OBJECTIVES:
1. Introduce data mining techniques including predictive, descriptive and visualization modeling and their effective use in discovering interesting hidden patterns in large volume of data generated by businesses, science, web, and other sources.
2. Focus is on the data preparation, classification, clustering, association analysis, and pattern evaluation

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, and their use in frequency domain filtering.
4. Demonstrated understanding of the fundamental image enhancement algorithms such as histogram modification, contrast manipulation, and edge detection.

SYLLABUS
Scope: Lab Experiments using software like Clementine and Informatica or WeKa Tools

1. Demonstration of preprocessing on some datasets eg. Student.aarfl/ labor.aarfl/Iris/ loan/etc
2. Demonstration of Data Visualization using Weka/ SYSTAT/ R programming language
3. Demonstration of Association Rules extraction on Market basket data using apriori/ FP Algorithms
4. Demonstration of Classification Rule extraction a bench mark dataset using j48/ID3 Algorithm
5. Demonstration of Classification Rule Process on any datasets using Navie Bayes Algorithm
6. Demonstration of Classification Rule Process on any datasets using K-nearest Neighbor classification Algorithm
7. Demonstration of partitional Clustering on any datasets using K-means Algorithm
8. Demonstration of Clustering on any datasets using simple K-medoids algorithm
9. Demonstration of Clustering rules process on any datasets of images using DB Scan algorithm
10. Demonstration of Clustering rules process on any datasets using Birch Algorithm

TEXT BOOK:
1. Data Mining- Concepts and Techniques by Jiawei Han, Micheline Kamber and Jian Pei – Morgan Kaufmann publishers – 3rd edition
REFERENCE BOOKS:

1. Data Mining Techniques, A.K.Pujari, University Press Data mining concepts by Tan, Steinbech, and Vipin Kumar - Pearson Edu publishers
2. Data Mining – Introductory and Advanced by Margarett Dunham - Pearson Education publishers
3. Data Warehousing for Real – world by Sam Annahory - Pearson Education publishers
OBJECT ORIENTED SOFTWARE ENGINEERING LAB
(Common for M.Tech (CST, IT))

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

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. Students can design and implement complex software solutions. and test and document software.
2. They are capable of working as part of a software team and develop significant projects

SYLLABUS
1. The purpose of the Software Engineering Lab course is to familiarize the students with modern software engineering methods and tools, Rational Products. 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 requiring approximately 60-80 hours from each project team.
2. The goal of the Software Engineering Project is to have a walk through from the requirements, design to implementing and testing. An emphasis is put on proper documentation. Extensive hardware expertise is not necessary, so proportionate attention can be given to the design methodology.
3. Despite its apparent simplicity, the problem allows plenty of alternative solutions and should be a motivating and educating exercise. Demonstration of a properly functioning system and sufficient documentation is proof of a completed assignment.
4. Term projects are projects that a group student or might take through from initial specification to implementation. The project deliverables include

Projects
1. Documentation including
   a. A problem statement
   b. A requirements document
5. A design document
7. Manuals/guides for
   a. Users and associated help frames
   b. Programmers
   c. Administrators (installation instructions)
8. A project plan and schedule setting out milestones, resource usage and estimated costs.
9. A quality plan setting out quality assurance procedures
10. An implementation.

REFERENCE BOOKS:

1. Project-based software engineering: An Object-oriented approach, Evelyn Stiller, Cathie LeBlanc, Pearson Education
3. UML2 Toolkit, Hans -Erik Eriksson, etc; Wiley.
SEMINARY

<table>
<thead>
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<th>Lab</th>
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The viva-voce for the seminar shall be held with the faculty member, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 40, 20 and 40 percent by the members respectively.
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
M.TECH (COMPUTER SCIENCE AND TECHNOLOGY)
Scheme of Instruction and Examination
(Regulation: R16)
(with effect from 2016-2017 admitted batch onwards)

III SEMESTER

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<th>Course Code</th>
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<th>Credits</th>
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1. Candidates can do their thesis 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.

2. The Thesis Work -Preliminary 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, External Examiner, PG coordinator and guide. The marks shall be awarded in the ratio of 20, 40, 20 and 20 percent by the members respectively.
### IV SEMESTER

<table>
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<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Scheme of Examination</th>
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<td>Viva-voce</td>
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1. 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.

2. The Thesis should be submitted at the end of 4th semester and it will be evaluated through Viva–Voce examination by a committee consisting of Head of the Department, External Examiner, PG coordinator and thesis guide. The marks shall be awarded in the ratio of 20, 40, 20 and 20 percent by the members respectively.
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## M.TECH (COMMUNICATION SYSTEMS)

### Scheme of Instruction and Examination

(Regulation: R16)

(with effect from 2016-2017 admitted batch onwards)

### I - SEMESTER

<table>
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### Course Code

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<td>M16 CS 1107</td>
<td>Microwave Components and Networks</td>
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<tr>
<td>M16 CS 1108</td>
<td>Advanced Microprocessor</td>
</tr>
<tr>
<td>M16 CS 1109</td>
<td>Embedded Systems</td>
</tr>
</tbody>
</table>
COMMUNICATION THEORY

Theory : 4 Periods
Exam : 3 Hrs.

Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:

1. To prepare mathematical background for communication signal analysis.
2. To understand the building blocks of Analog and digital communication system.
3. To understand and analyze the signal flow in Analog and digital communication system.
4. To present the essential digital communication concepts by understanding the elements of digital communication system, fundamental concepts of sampling theorem.
5. To analyze error performance of a digital communication system in presence of noise and other interferences.
6. To learn different estimation methods.

COURSE OUTCOMES:

Acquired knowledge about
1. AM transmission and reception
2. FM and PM transmission and reception, pulse modulation, noise
3. Digital communication, quantization, coding, digital modulation techniques, ISI
4. Different estimation methods.

SYLLABUS

Analog Communication: Mathematical treatment of Linear (AM, DSB-SC, SSB and VSB) and exponential (PM and FM) modulation; spectra of angle modulated signals; Noise performance of linear and exponential modulated signals; PE and DE in FM.

Pulse Modulation: Sampling of low-pass and band-pass signals, PAM, PWM, PPM, quantization, PCM, DPCM, Delta modulation, base band digital communication; Nyquist pulse shaping, line codes.

Digital Modulation Techniques: Representation of digital signal waveforms, Introduction to digital modulation schemes- ASK, PSK and FSK; Digital demodulation and the optimal receiver, performance of digital communication systems in the presence of noise, coherent quadrature modulation techniques.

Detection and Estimation Theory: Binary hypothesis testing, Bayes, Minimax and Neyman-Pearson tests; Bayesian parameter estimation, MMSE, MMAE and MAP estimation procedures.
TEXT BOOKS:


REFERENCE BOOKS:

COMMUNICATION TECHNIQUES

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COURSE OBJECTIVES:

1. To understand the building blocks of digital communication system.
2. To prepare mathematical background for communication signal analysis.
3. To understand and analyze the signal flow in a digital communication system.
4. To present the essential digital communication concepts by understanding the elements of digital communication system, fundamental concepts of sampling theorem and coding.
5. To analyze error performance of a digital communication system in presence of noise and other interferences.
6. To understand concept of spread spectrum communication system.
7. To provide knowledge about error detection and correction, different types of channel coding techniques such as linear block codes, cyclic code and convolution codes are to be discussed.

COURSE OUTCOMES:

After successfully completing the course students will be able to,

1. Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.
2. Perform the time and frequency domain analysis of the signals in a digital communication system.
3. Select the blocks in a design of digital communication system.
4. Select the relevant digital modulation technique for specific application.
5. Choose the coding technique for minimum errors in transmitting information.
6. Ability to use channel coding techniques (such as block & convolutional codes) in communication systems.
7. Ability to use modulation techniques (such as frequency & phase-shift keying) in communication systems.
8. Analyze Performance of spread spectrum communication system.

SYLLABUS

Channel Coding-I: Waveform coding and structured sequences-Types of error control, structured sequences, Linear block codes –soft/hard decision decoding of linear block codes – Polynomial representation of codes – Cyclic codes – Convolution codes – viterbi decoding algorithm.

Channel Coding-II: Non binary block codes and concatenated block codes - Reed Solomon codes – Turbo codes.
**Baseband Signaling Concepts**: Signaling formats – RZ/NRZ, Duobinary splitphase (Manchester) and high density bipolar coding – scrambling & unscrambling – channel equalization – tapped delay line and traversal filters.

**Synchronization**: Receiver synchronization, costas loop, symbol synchronization, synchronization with CPM – Data aided and Non aided synchronization- synchronization methods based on properties of wide sense cyclo-stationary random process – Carrier recovery circuits – Symbol clock estimation schemes.


**TEXT BOOKS**:


**REFERENCE BOOKS**:

SATELLITE COMMUNICATION AND PHASED ARRAYS

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COURSE OBJECTIVES:

1. To learn about the science behind the orbiting satellites, various multiplexing schemes and earth station parameters used for satellite communication.
2. To learn about link budgets for uplink and downlink for both satellite communication and mobile communication.
3. To understand knowledge regarding earth station equipment.
4. To know the operation of MSAT and VSAT networks and its applications.
5. To provide a brief introduction about phased array antennas.

COURSE OUTCOMES:

1. The students will learn the dynamics of the satellite in the orbit.
2. Understand communication satellite design and how analog and digital technologies are used for satellite communication networks.
3. The students will be able to design satellite uplink and downlink and calculate link budgets.
4. Understand the operation of Earth station equipment, MSAT and VSAT networks.
5. The students will understand the concept of phased arrays.

SYLLABUS


**Multiple Access:** FDMA, TDMA, CDMA, SSMA- comparison of multiple access techniques, Practical Demand Access systems, Multiple Access With on board processing.

**Earth Station Technology:** Earth Station Design, Design of Large Antennas, Tracking, Small earth station Antennas, Equipment for earth station; Satellite Packet Communications- Message transmission by FDMA: The M/G/1 Queue, Message transmission by TDMA - Pure ALOHA

**Very small Aperture Terminal Networks:** VSAT Technologies - Network Configurations, Polling VSAT Networks; Mobile Satellite Networks--Operating Environment - MSAT Network concept.
Phased Arrays in Radar and Communication Systems: System requirements for radar and communication antennas, Array characterization for radar and communication systems, Fundamental results from array theory.

TEXT BOOKS:

1. Satellite Communications by T. Pratt and C.W. Bostian, John Wiley & Sons

REFERENCE BOOKS:

1. Satellite Communications - by Dr. D.C. Agarwal, khanna Publishers, NewDelhi
2. Electronic Communication Systems -by Tomasi. W, PHI
# DIGITAL SIGNAL PROCESSING

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## COURSE OBJECTIVES:

1. To learn about various optimization techniques used in designing the digital filters.
2. To learn about the sampling rate requirement in the digital signal applications.
3. To learn about the need for prediction, filtering & smoothening of the signals to minimize the mean-square error (MSE).
4. To learn different DSP algorithms used for DFT computation procedures.
5. To know the applications of DSP in real time.

## COURSE OUTCOMES:

1. Using filter optimization techniques students will be able to design a filter with Least Mean Square error.
2. Students will be able to solve research papers related to multirate signal processing—Data Acquisition, Bandwidth reduction in a system etc.
3. Apply methods for prediction of real world signals, based on signal modeling and advanced filtering techniques, such as Linear Predictive Filters and Optimal Linear Filters.
4. Apply fundamental principles, methodologies and techniques of the course to analyze and design various problems encountered in academic research, industry and R&D practice.
5. This course is basis for understanding Adaptive signal processing, statistical signal processing and wavelet transform subjects.

## SYLLABUS

**Advanced digital filter design techniques**: Multiple band optimal FIR filters – design of filters with simultaneous constraints in time and frequency response, optimization methods for designing IIR filters, comparison of optimum FIR filters and delay equalized elliptic filters.

**Multirate DSP**: The basic sample rate alteration – time – domain characterization, frequency – domain characterization: Cascade equivalences, filters in sampling rate alteration systems, digital filter banks and their analysis and applications, multi level filter banks, estimations of spectra from finite – duration observation of signals.

**Linear prediction and optimum liner filters**: forward and backward linear prediction, AR Lattice and ARMA lattice – ladder filters, Wieners filters for filtering on prediction.

**DSP Algorithms**: The Goertzel algorithm, the chirp – z transform algorithm the Levinson – Durbin algorithms, the Schur algorithm, and other algorithms, computations of the DFT, concept of tunable digital filters.
Applications of DSP:

a) Speech: Model of speech production, speech analysis – synthesis system vocoder analyzers and synthesizers, linear prediction of speech.

b) DTMF System

TEXT BOOKS:

1. Theory and applications of digital signal processing by Lawrence R. Rabiner and Bernard Gold, PHI

REFERENCE BOOKS:

COURSE OBJECTIVES:

1. To expose the students to the basics of signal propagation through optical fibers, fiber impairments, components and devices and system design.
2. To analyze the operation of LEDs, laser diodes, and PIN photo detectors (spectral properties, bandwidth, and circuits) and apply in optical systems.
3. To explain the principles, compare and contrast single- and multi-mode optical fiber characteristics.
4. To analyze and design optical communication and fiber optic sensor systems.
5. To design, build, and demonstrate optical fiber experiments in the laboratory.
6. To locate, read, and discuss current technical literature dealing with optical fiber systems.

COURSE OUTCOMES:

1. Recognize and classify the structures of Optical fiber and types.
2. Discuss the channel impairments like losses and dispersion.
3. Analyze various coupling losses.
4. Classify the Optical sources and detectors and to discuss their principle.
5. Familiar with Design considerations of fiber optic systems.
6. To perform characteristics of optical fiber, sources and detectors, design as well as conduct experiments in software and hardware, analyze the results to provide valid conclusions.

SYLLABUS

Optic Fiber Waveguides: Step – Index Fiber, Graded – Index Fiber, Attenuation, Modes in Step-Index Fibers, Modes in Graded – Index Fibers, Pulse Distortion and Information Rate in Optic Fibers, Construction of Optic Fibers, Optic Fibers, Optic Fiber Cables.


TEXT BOOK:

REFERENCE BOOKS:
EMI / EMC

**Theory** : 4 Periods

**Exam** : 3 Hrs.

**Sessionals** : 30

**Ext. Marks** : 70

**Credits** : 4

**COURSE OBJECTIVES:**

1. To familiarize with the fundamentals those are essential for electronics industry in the field of EMI / EMC
2. To understand EMI sources and its measurements.
3. To understand the various techniques for electromagnetic compatibility.

**COURSE OUTCOMES:**

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

1. Real-world EMC design constraints and make appropriate tradeoffs to achieve the most cost-effective design that meets all requirements.
2. Designing electronic systems that function without errors or problems related to electromagnetic compatibility
3. Diagnose and solve basic electromagnetic compatibility problems.

**SYLLABUS**

**Introduction, Natural and Nuclear sources of EMI / EMC:** Electromagnetic environment, History, Concepts, Practical experiences and concerns, frequency spectrum conservations. An overview of EMI / EMC, Natural and Nuclear sources of EMI.

**EMI from apparatus, circuits and open area test sites:** Electromagnetic emissions, noise from relays and switches, non-linearities in circuits, passive intermodulation, cross talk in transmission lines, transients in power supply lines, electromagnetic interference (EMI). Open area test sites and measurements.

**Radiated and conducted interference measurements and ESD:** Anechoic chamber, TEM cell, GH TEM Cell, characterization of conduction currents / voltages, conducted EM noise on power lines, conducted EMI from equipment, Immunity to conducted EMI detectors and measurements. ESD, Electrical fast transients / bursts, electrical surges.

**Grounding, shielding, bonding and EMI filters:** Principles and types of grounding, shielding and bonding, characterization of filters, power lines filter design.

**Cables, connectors, components and EMC standards:** EMI suppression cables, EMC connectors, EMC gaskets, Isolation transformers, optoisolators, National / International EMC standards.
TEXT BOOKS:


REFERENCE BOOKS:

MICROWAVE COMPONENTS AND NETWORKS

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COURSE OBJECTIVES:

1. To explain the concepts of static electric fields, steady magnetic fields, Maxwell’s Equations and EM wave concepts.
2. To explain the operation of signal generators and waveguide components at Microwave frequencies.
3. To analyze the operation of different waveguide components using scattering matrix.
4. To familiarize with the materials used and fabrication techniques of MMICs.
5. To gain an understanding with the experimental procedures involving measurements of different Microwave parameters.

COURSE OUTCOMES:

After completing the course the student will be able to demonstrate the knowledge and will have the ability to:

1. Explain the operation of different microwave signal generators and waveguide components.
2. Mathematically analyze the operation of different Signal generators.
3. Mathematically analyze the operation of different waveguide components using scattering matrix.
4. Understand different fabrication techniques involving Microwave integrated circuits.
5. Understand and implement different experimental procedures involving measurement of microwave parameters.

SYLLABUS

Introduction: Microwaves and applications, advantages of microwaves, EM spectrum domain, electric and magnetic fields static electric and magnetic fields, time varying electric and magnetic fields, electromagnetic field equations, maxwell’s equations for time-varying fields, meaning of maxwell’s equations, characteristics of free space, power flow by microwaves, expression for propagation constant of a microwave in conductive medium, microwave applications, relation between dB, dBm, dBμ.

Microwave Tubes: Limitation of conventional tubes, microwave tubes, velocity modulation, method of producing the velocity modulation, principle of operation of two cavity klystron, reflex klystron principle of operation, velocity modulation in reflex klystron, applegate diagram with gap voltage for a reflex klystron. Principle of operation of magnetron, hull cutoff condition, advantages of slow wave devices, principle of operation of TWT.
**Microwave Semiconductor Devices:** Microwave bipolar transistor, FET, Principle of Operation and application of tunnel diode, Principle of operation of Gunn diode, application of Gunn diode advantages of Gunn diode, salient features of IMATT and TRAPATT diodes, applications of IMATT and TRAPATT diodes, principle of operation of PIN diode, applications of PIN diode.

**Scattering Matrix Parameters of microwave networks:** Definition of scattering matrix, characteristics of S-matrix, scattering matrix of a two-port network, salient features of S-matrix, salient features of multiport network, losses in microwave circuits, return loss, insertion loss, transmission loss, reflection loss, impedance matrix, short circuit admittance parameters of a π-network, S-matrix of series element in the transmission line, S-matrix for circulator, S-matrix for isolator, S-matrix for E-plane Tee junction, S-matrix for H-plane Tee junctions, S-matrix for directional coupler.

**Microwave Passive components:** Rectangular waveguides resonator isolator, types of attenuators, fixed attenuators, step attenuators, variable attenuators, salient features of directional coupler, parameters of directional coupler, coupling factor, directivity, applications of directional coupler.

**Microwave Integrated Circuits:** Salient features of MICs, types of electronic circuits, monolithic microwave integrated circuits (MMICs), film integrated circuit, advantages of MMICs, Basic materials used in MMIC fabrication, examples, characteristics and properties of substrate, conductor, dielectric and resistive materials, MMIC fabrication techniques, diffusion and ion implantation, oxidation and film deposition, epitaxial growth, lithography, etching and photo resist, deposition methods, steps involved in the fabrication of MOSFET

**Microwave measurements:** Measurement of VSWR, attenuation, dielectric constant, calibration of attenuator and Wave meter.

**TEXT BOOKS:**

1. “Microwave Engineering” by Prof. GSN Raju, IK International Publishers, 2007

**REFERENCE BOOKS:**

ADVANCED MICROPROCESSOR

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<th>Theory</th>
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COURSE OBJECTIVES:

1. To study about the architecture, pin configuration, timing diagrams and addressing modes of 8086.
2. To study about the instruction sets, Assembler Directives and operators and to acquire the knowledge of programming.
3. To study about the Interrupts of 8086/8088.
4. To study about architecture, Pin-out of 80186 microprocessor, Timing (Read / Write cycles) of 80186.
5. To study about the introduction of 80386, 80486 and Pentium Processor.

COURSE OUTCOMES:

1. After completing of this subject students will learn the basics of 16 bit microprocessor.
2. Understanding the microprocessor architecture assembly language programming.
3. They are able to conclude the delays for 8086.

8086/8088 Microprocessor: Register organization of 8086, architecture, Physical memory organization, I/O addressing capability, Minimum mode and Maximum mode system and timings, addressing modes of 8086


Special architectural features and related programming: Stack structure of 8086, Interrupts and Interrupt service routines, Interrupt cycle of 8086/8088, Non maskable interrupts, maskable interrupt (INTR), Interrupt Programming, MACROS, Timing and Delay

80186 and 80286 16 bit microprocessors: 80186/80188 architecture, Pin-out of 80186 microprocessor, Programming the 80186/80188 enhancements, 80186/80188 Timing (Read / Write cycles), 80186 programmable interrupt controller and DMA Controller, Internal Architecture of 80286

80386/80486 Microprocessors: Introduction to 80386 microprocessor, Special 80386 registers, Memory management, moving to protected mode, Virtual 8086 mode, Memory paging mechanism, Introduction to 80486 and Pentium Processor.
TEXT BOOKS:
2. The INTEL Microprocessors , Barry B Bray,& C.R.Sarma, Pearson Education Ltd, New Delhi, First Indian reprint-2005

REFERENCE BOOKS:
1. The Intel microprocessors 8088/80186,80286,80386,80486,Pentium and Pentium- pro processor Architecture, Programming and Interface by Barray B.Berry, 4th Edition, PHI
EMBEDDED SYSTEMS

Theory : 4 Periods  Sessionals : 30
Exam : 3 Hrs.  Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:

1. To introduce students to the modern embedded systems and to show how to understand and program such systems using a concrete platform.
2. Students have knowledge about the basic functions of embedded systems.
3. Students have knowledge about the applications of embedded systems.
4. Students have knowledge about the development of embedded software.

COURSE OUTCOMES:

Students are able to

1. Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems.
2. Discuss the basics of embedded systems and the interface issues related to it.
3. Learn the different techniques on embedded systems.
4. Discuss the real time models, languages and operating systems.
5. Analyze real time examples.

SYLLABUS

Introduction to Embedded Systems: An embedded system – processor in the system – Hardware units – software embedded into a system – exemplary embedded systems – embedded system – on-chip and in VLSI circuit.

Processor and Memory Organization: structural units in a processor – processor selection for an embedded system – memory devices – memory selection for an embedded system – allocation of memory to program segments and blocks and memory map of a system – direct memory access – interfacing processor, memories and I/O devices.

Devices & Buses for Device Networks: I/O devices – timer & counting devices – serial communication using the ‘I2C’, ‘CAN’ and advanced I/O buses between the networked multiple devices – host system or computer parallel communication between the networked I/O multiple devices using the ISA, PCI, PCI-X and advanced buses.

Device Drivers and Interrupts Servicing Mechanism: Device drivers – parallel port device drivers in a system – serial port device drivers in a system – device drivers for internal programmable timing devices – interrupt servicing mechanism – context and the periods for context switching, deadline and interrupt latency.
Programming Concepts and Embedded Programming in ‘C’ : Software programming in assembly language (ALP) and in high level language ‘C’ – ‘C’ program elements : Header and source files and preprocessor directives – program elements : macros and functions – data types, data structures, modifiers, statements, loops and pointers – Queues – stacks – lists and ordered lists – ‘C’ program compiler and cross compiler – optimisation of memory needs.

Program modeling concepts in single and multiprocessor systems software-development process: Modeling processor for software analysis before software implementation – programming models for event controlled or response time constrained real time program – modeling of multiprocessor systems.

TEXT BOOKS:


REFERENCE BOOKS:

2. An introduction to the design of small scale embedded systems with examples from PIC, 8051 and 68HC 05/08 Micro controllers by Tin Wilmshurst, Palgrave, Great Britain, 2001.
COMMUNICATION ENGINEERING LAB

Lab : 4 Periods  Sessionals : 50
Exam : 3 Hrs.  Ext. Marks : 50
Credits : 2

COURSE OBJECTIVES:

1. To practice the basic theories of communication 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.

COURSE OUTCOMES:

1. Graduate will demonstrate the ability to identify, formulate and solve Communication engineering problems.
2. Graduate will demonstrate the ability to design and conduct experiments, analyze and interpret data.
3. Graduates will demonstrate the ability to design a Communication system or process as per needs and specifications.
4. Graduate will demonstrate the skills to use modern engineering tools, softwares and equipment to analyze problem.

LIST OF EXPERIMENTS:

1. Time Division Multiplexing of signals & Framing in the TDM
2. Study of Manchester Coder – Decoder
3. Forming a PC to PC Communication Link using Optical Fider and RS 232 interface
4. Measurement of various losses in an Optical Fiber
5. Measure the Scattering parameters of the devices: Circulator & Hybrid TEE
7. Measurement of Q-factor of cavity resonator
8. Simulation of Digital Communication Modulators/ Demodulators using MATLAB-SIMULINK
9. Simulation of Channel coding/decoding using MATLAB- SIMULINK
10. Spectrum Analysis using Spectrum Analyzer
11. Study of Cellular communications Systems
12. Study of Satellite communication Receiver
REFERENCE BOOKS:

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The viva-voce for the seminar shall be held with the faculty member, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 40, 20 and 40 percent by the members respectively.
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

M.TECH (COMMUNICATION SYSTEMS)

Scheme of Instruction and Examination
(Regulation:R16)
(with effect from 2016-2017 admitted batch onwards)

II – SEMESTER

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<td>M16 CS 1206</td>
<td>Modern Radar Systems</td>
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<td>M16 CS 1207</td>
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<td>M16 CS 1211</td>
<td>Wavelet Transforms and Its Applications</td>
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<td>M16 CS 1212</td>
<td>Statistical Signal Processing</td>
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RF AND MICROWAVE ENGINEERING

COURSE OBJECTIVES:

1. RF and Microwave Engineering introduces the student to RF/microwave analysis methods and design techniques. Scattering parameters are defined and used to characterize devices and system behavior.
2. Passive and active devices commonly utilized in microwave subsystems are analyzed and studied.
3. Design procedures are presented along with methods to evaluate Matching networks using Smith chart.
4. Analytical techniques are presented for designing of Amplifiers and oscillators at RF and microwave frequencies.

COURSE OUTCOMES:

1. Gain knowledge and understanding of microwave analysis methods.
2. Be able to apply analysis methods to determine circuit properties of passive/active microwave devices.
3. Know how to model and determine the performance characteristics of a microwave circuit or system using Smith chart.
4. Be able to design microwave amplifiers and oscillators for required parameters such as stability, gain, noise.

SYLLABUS

Introduction to RF and Microwave concepts and applications: Introduction, Reasons for using RF/Microwaves, RF/Microwave applications, Radio frequency waves, RF and Microwave circuit design, The unchanging fundamentals versus the ever-evolving structure, General active circuit block diagrams.

RF Electronics Concepts: Introduction, RF/Microwaves versus DC or low AC signals, EM spectrum, Wave length and frequency, Introduction to component basics, Resonant circuits, Analysis of a simple circuit in phasor domain, Impedance transformers, RF impedance matching, Three element matching.

Smith Chart and its Applications: Introduction, A valuable graphical aid the smith chart, Derivation of smith chart, Description of two types of smith charts, Smith charts circular scales, Smith charts radial scales, The normalized impedance-admittance (ZY) smith chart introduction, Applications of the smith chart, Distributed circuit applications, Lumped element circuit applications.
RF and Microwave Amplifiers Small and Large Signal Design: Introduction, Types of amplifiers, Small signal amplifiers, Design of different types of amplifiers, Multistage small signal amplifier design. Introduction, High-power amplifiers, Large signal amplifier design, Microwave power combining/dividing techniques, Signal distortion due to inter modulation products, Multistage amplifiers, Large signal design.


TEXT BOOK:


REFERENCE BOOKS:

COURSE OBJECTIVES:

1. Understand the cellular radio concepts such as frequency reuse, handoff and how interference between mobiles and base stations affects the capacity of cellular systems.
2. Identify the techno-political aspects of wireless and mobile communications such as the allocation of the limited wireless spectrum by government regulatory agencies.
3. To have an overview of wireless and mobile communications in different generations.
4. To study the operation of basic cellular system and performance criterion, handoff mechanism.
5. To study the design of cellular mobile system.
6. Understand propagation effects such as fading, time delay spread, and Doppler spread, and describe how to measure and model the impact that signal bandwidth and motion have on the instantaneous received signal through the multipath channel.
7. Understand the information theoretical aspects (such as the capacity) of wireless channels and basic spread spectrum techniques in mobile wireless systems
8. Describe current and future cellular mobile communication systems (GSM, IS95, WCDMA, etc), wireless LANs, adhoc and sensor networks
9. To develop the ability to search, select, organize and present information on new technologies in mobile and cellular communications

COURSE OUTCOMES:

1. Understand the cellular radio concepts such as frequency reuse, handoff and how interference between mobiles and base stations affects the capacity of cellular systems.
2. Students are capable to analyze and solve problems in the field of telecommunications.
3. Students will have the understanding of different generations, operations and design of wireless and mobile communications.
4. Understand the concept of frequency Reuse channels, Deduce the Co-channel interference reduction factor.
5. Design of Antenna system to reduce Co-channel interference. Understand adjacent channel interference, near end far end interference
6. Understand cell site and mobile antennas. Understand frequency management and channel assignment strategies
7. Define Handoff, Distinguish types of handoffs and evaluation of dropped call rates.
8. Understand propagation effects such as fading, time delay spread, and Doppler spread, and describe how to measure and model the impact that signal bandwidth and motion have on the instantaneous received signal through the multipath channel.
9. Understand the information theoretical aspects (such as the capacity) of wireless channels and basic spread spectrum techniques in mobile wireless systems
SYLLABUS

Introduction to wireless communications, examples of wireless communication system, the Cellular concept and system design fundamentals, Frequency reuse, Channel assignment strategies, Handoff strategies, Interfearance and system capacity, Trunk and grade services, Methods for improving coverage and capacity in cellular system.

Multiple access techniques for wireless communications FDMA, TDMA, Spread spectrum techniques, SDMA, Packet Radio, CSMA, Capacity of cellular CDMA with multiple cells and capacity of SDMA.

Wireless systems and standards, AMPS, IS-94, GSM traffic, Examples of GSM cell, Frame structure of GSM cell, details of forward and reverse CDMA channels.

Personal access communication systems, Personal Mobile satellite communications, Integrating GEO, LEO, MEO Satellite and terrestrial mobile systems, Rake receiver

Mobile Radio propagation, Large scale path loss, Reflection, Diffraction, Scattering, Outdoor and Indoor propagation models, Small signal fading and multi path, measurement of small scale path loss, parameters of multi path channels, fading due to multi path, small scale fading models.

TEXT BOOKS:

2. Wireless Digital Communications, Dr. KAMITO FEHER, PHI
3. Electronic Communication System, WAYNE TOMASI, PHI
4. Wireless Communications, SANJY SHARMA, S.K Kataria & sons

REFERENCE BOOKS:

GLOBAL POSITIONING SYSTEM AND APPLICATIONS

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:

1. To enable student to understand the basic principle of GPS
2. To enable student to understand the difference between GPS, GALILEO and GLONASS
3. To familiarize the student with the concepts of different co-ordinates system used in GPS
4. To enable student to know about the effect of ionosphere and troposphere on GPS position determination

COURSE OUTCOMES:

1. Students can describe each of the 3 main segments of GPS/GNSS: Space (the three components of the satellite signal), Control (worldwide control stations) and User (the receiver).
2. Students can understand the history of NAVSTAR GPS and other GNSS systems and be able to compare their characteristics: the number of operational satellites, number of orbital planes, orbit shape, orbit inclination, orbital period and satellite altitude.
3. Students can understand how trilateration is used to determine a user’s location with a GPS and how to calculate pseudorange.
4. Students understand the different accuracies of consumer, mapping and survey grade GPS units and their respective research applications.

SYLLABUS

Overview of GPS : Basic concept, system architecture, space segment, user segment, GPS aided Geo-augmented navigation (GAGAN) architecture.

GPS Signals : Signal structure, anti spoofing (AS), selective availability, Difference between GPS and GALILEO satellite construction.

GPS coordinate frames, Time references : Geodetic and Geo centric coordinate systems, ECEF coordinate world geodetic 1984 (WGS 84), GPS time.

GPS orbits and satellite position determination : GPS orbital parameters, description of receiver independent exchange format (RINEX) – Observation data and navigation message data parameters, GPS position determination.
GPS Errors: GPS error sources – clock error, ionospheric error, tropospheric error, multipath, ionospheric error estimation using dual frequency GPS receiver.

TEXT BOOK:


REFERENCE BOOKS:

TELECOMMUNICATION SWITCHING AND NETWORKS

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COURSE OBJECTIVES:

1. To learn basics of switching systems and design of different switching systems.
2. To understand and designing of multistage networks
3. To understand different switching systems such as electronic space division switching and time division switching
4. To understand different signaling techniques and networks and topologies.
5. To understand the overall data communication and switching networks.

COURSE OUTCOMES:

Students will be able to

1. Understand the complete switching system.
2. Understand the probabilistic methods and statistics to solve communication network problems.
3. Understand effectively the communication principles to design, develop and implement communication networks.
4. Understand the complete system of communication and switching networks.

SYLLABUS

Resource sharing and need for switching: Circuit switching, Store and forward switching, Packet switching, electronic space division switching, Need for networks, two stage networks, three stage networks and n-stage networks.

Time Division Switching: Time switching, space switching, three stage combination switching, n-stage combination switching; Traffic engineering: Hybrid switching, Erlang formula and signaling.

High speed digital access: DSL technology, Cable Modem, SONET.

Local area networks: Traditional ETHERNET, fast ETHERNET, Gigabit ETHERNET, Wireless LAN, Bluetooth, Connecting LAN’s, Backbone networks.

Integrated Services Digital Network: Network & protocol architecture, user network interfaces, signaling, inter networking, expert systems in ISDN, Broadband ISDN.

TEXT BOOKS:


REFERENCE BOOKS:

MODELLING AND SIMULATION OF COMMUNICATION SYSTEMS

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COURSE OBJECTIVES:

1. Describe, investigate and analyze complex engineering systems and associated issues (using systems thinking and modeling techniques)
2. Comprehend and apply advanced theory-based understanding of engineering fundamentals and specialist bodies of knowledge in the selected discipline area to predict the effect of engineering activities
3. Apply underpinning natural, physical and engineering sciences, mathematics, statistics, computer and information sciences.
4. Develop creative and innovative solutions to engineering challenges.

COURSE OUTCOMES:

Upon successful completion of this course student should be able to

1. Characterize a given engineering system in terms of its essential elements, that is, purpose, parameters, constraints, performance requirements, subsystems, interconnections and environmental context.
2. Develop a modeling strategy for a real world engineering system, which considers prediction and evaluation against design criteria, and integrates any required sub-system models.
3. Assess and select a model for an engineering system taking into consideration its suitability to facilitate engineering decision making and predicted advantages over alternative models.
4. Interpret the simulation results of an engineering system model, within the context of its capabilities and limitations, to address critical issues in an engineering project.

SYLLABUS


**TEXT BOOKS:**


**REFERENCE BOOKS:**

MODERN RADAR SYSTEMS

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:

1. To become familiar with fundamentals of RADAR.
2. To gain in depth knowledge about the different types of RADAR and their operations.
3. To explain signal detection in RADAR and various detection techniques.
4. To become familiar with RADAR navigation techniques.

COURSE OUTCOMES:

After completing the course the student will be able to

1. Explain fundamentals of Surveillance Radar and Design.
2. Understand and analyze the operation of different tracking Radars.
3. Understand and explain the waveform design concepts of Radars.

SYLLABUS

Fundamentals of Surveillance Radar and Design:
Bandwidth considerations, prf, Unambiguous range and velocity, Pulse length and Sampling, Radar Cross-section and Clutter.

Tracking Radar:
Tracking and Search Radars, Antenna beam shapes required, Radar guidance, Frequency agility, Importance of Monopulse Radar.

Radar waveform design:
Bandwidth and pulse duration requirements, Range and Doppler accuracy uncertainty relation, pulse compression and phase coding.

Principles of Secondary Surveillance Radar:
Radar studies of the atmosphere, OHR and Radar jamming, EC, ECC measures and stealth applications.

TEXT BOOKS:

REFERENCE BOOKS:
DIGITAL IMAGE PROCESSING

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:

1. To introduce techniques and tools for digital image processing.
2. To introduce image analysis techniques in the form of image segmentation.
3. To develop on-hand experience in applying tools to process images.
4. To develop engineering skills and intuitive understanding of the tools used in Image Processing.

COURSE OUTCOMES:

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

1. Describe different modalities and current techniques in image acquisition
2. Describe how digital images are represented and stored efficiently depending on the desired quality, color depth, dynamics
3. Use the mathematical principles of digital image enhancement
4. Describe and apply the concepts of feature detection and contour finding algorithms.
5. Analyze the constraints in image processing when dealing with larger data sets.

SYLLABUS


Image Encoding: Objective an subjective Fidelity Criterias, the encoding process, the Mapping, the Quantizer and the Coder, Contour Encoding, Run length Encoding, Image Encoding relative to a Fidelity Criterion, Differential Pulse Code Modulation, Transform Encoding.
**Image Compression:** Fundamentals, Image compression models, error free compression, lossy compression, image compression standards.

**Image Segmentation:** The detection of Discontinuities, Point Line and Edge Detections, Gradient Operators, Combined Detection, Thresholding.

**Image Representation:** Representation Schemes, Chain Codes, Polygon Approximation, Boundary Descriptors, Simple Descriptors, Shape Numbers, Fourier Descriptors.

**Image Construction from Projections:** Radon Transforms, Convolution/filterback Projection.

**TEXTBOOKS:**


**REFERENCE BOOKS:**

VLSI DESIGN

**Theory** : 4 Periods

**Exam** : 3 Hrs.

**Sessionals** : 30

**Ext. Marks** : 70

**Credits** : 4

### COURSE OBJECTIVES:

1. To Study the basics of NMOS, PMOS AND CMOS technologies along with construction, types, working, characteristics and fabrication and the combination of Bipolar and MOS technology and design of logic gates using nMOS, pMOS, CMOS technologies, stick diagrams and layouts.

2. To study Analog VLSI circuits, MOS Multipliers, MOS Resistors, Opamp design in CMOS and Bipolar Configurations

3. To study the design of combinational circuits, power consumption in CMOS circuits, different design techniques to reduce switching activity

4. To study the Data Path Operations ,Addition/Subtraction ,Parity Generators, Comparators, Zero/One Detectors ,Binary Counters, ALUs, Multiplication ,Shifters- Memory elements, control Finite-State Machines- Control Logic Implementation in CMOS sub system design

5. To study the Logic synthesis, simulation and testing, basic features of VHDL language, types of simulations, boundary scan test- fault simulation- automatic test pattern generation.

### COURSE OUTCOMES:

1. After completing of this subject, students will learn the basics of MOS and CMOS technologies.

2. They will be able to design combinational logic circuits using MOS and CMOS technologies and develop stick and layout diagrams with design rules.

3. They can also calculate equivalent resistances and capacitances of circuits and estimate power consumption and delay.

4. They will be able to use Switch logic or Gate logic in their design projects.

5. They will be able to design the Combinational and Sequential circuits by using VHDL Language.

### SYLLABUS

**Introduction To MOS Device**: MOS Transistor-First Glance at the MOS device MOS Transistor under static conditions-threshold voltage-Resistive operation-saturation region –channel length modulation-velocity saturation-Hot carrier effect-drain current Vs voltage charts – sub threshold conduction – equivalent resistance-MOS structure capacitance-Design A logic sates using NMOS and PMOS and CMOS devices-Stick Diagram.

Design of Combinational Logic Gates In CMOS: Static CMOS design-complementary CMOS – static properties A complementary CMOS design-Power consumption in CMOS logic gates-dynamic or glitching transitions – Design techniques to reduce switching activity – Radioed logic-DC VSL - pass transistor logic – Differential pass transistor logic sizing of level restorer-sizing in pass transistor-Dynamic CMOS design-Basic principles - Domino logic-optimization of Domino logic-NPCMOS-How to choose a logic style -Designing logic for reduced supply voltages.


Logic Synthesis, Simulation and Testing: Basic features of VHDL language for behavioral modeling and simulation- summary of VHDL data types- Dataflow and structural modeling-VHDL and logic synthesis- types of simulation- boundary scan test- fault simulation- automatic test pattern generation.

TEXT BOOKS:


REFERENCE BOOKS:

APPLICATION SPECIFIC INTEGRATED CIRCUITS (ASIC)

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COURSE OBJECTIVES:

1. The course focuses on the semi custom IC Design and introduces the principles of design logic cells, I/O cells and interconnect architecture, with equal importance given to FPGA and ASIC styles.
2. The entire FPGA and ASIC design flow is dealt with from the circuit and layout design point of view.
3. Deals with the supply circuit modules which are crucial modules in an IC design.
4. Clock generation circuits play a major role in High Speed Broad Band Communication circuits, High Speed I/O’s, Memory modules and Data Conversion Circuits.
5. This course focuses on the design aspect of Clock Generation circuits and their design constraints.

COURSE OUTCOMES:

After completing this course:

1. The student would have gained knowledge in the circuit design aspects at the next transistor and block level abstractions of FPGA and ASIC design. In combination with the course on CAD for VLSI, the student would have gained sufficient theoretical knowledge for carrying out FPGA and ASIC designs.
2. Essential know how to a designer to construct Supply reference circuits and Clock Generation Circuits for given design specifications and aids the designer to understand the design specifications related to Supply and Clock Generation Circuits.

SYLLABUS

Introduction to ASICs: Types of ASICs, Design flow, Economics of ASICs, ASIC cell libraries, CMOS Logic, CMOS design rules, Logic cells, I/O cells, cell compilers.

ASIC Library Design: Transistors as resistors, Transistor parasitic capacitance, Logical effort, Cell design, Programmable ASICs, Programmable ASIC logic cells, Programmable ASIC I/O cells, Programmable ASIC interconnect, Programmable ASIC design software.

Low-level design entry: Schematic entry, low-level design languages, PLA tools, EDIF, An overview of VHDL and verilog, Logic synthesis, Simulation.

ASIC construction, Floor planning and placement.
**CMOS System Core Studies:** Dynamic Warp Processors: Introduction, The problem, the algorithm, a functional overview, detailed functional specification, structural floor plan, physical design, fabrication, Hierarchical layout and design of single chip 32 bit CPU: Introduction, Design methodology, Technology updatability and layout verification.

**Practical Realities and Ground Rules:** Further thoughts on floor plans/layout, floor plan layout of the four bit processors, input/output (I/O) pads, “Real estate”, further thoughts on system delays, ground rules for successful design, scaling of MOS circuits.

**TEXT BOOK:**


**REFERENCE BOOKS:**

MULTIMEDIA COMMUNICATION SYSTEMS

Theory : 4 Periods
Exam : 3 Hrs.

Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:

1. Understanding the multimedia communications systems, application and basic principles,
2. Analysis of the multimedia streaming,
3. Performing and establishing multimedia communication terminals,
4. Presentation of multimedia communications

COURSE OUTCOMES:

1. On successful completion of this course, student should be able to
2. Describe technical characteristics and performance of multimedia system and terminals,
3. Design creative approach in application of multimedia devices, equipment and systems,
4. Carry out experiments and measurements on the multimedia systems in laboratory conditions on real components and equipment,
5. Interpret and analyze measurement results obtained on the multimedia system and components,
6. Describe the development process and applications of the multimedia systems,
7. Test multimedia communication systems and equipment in real conditions.

SYLLABUS


Audio Compression: Basic of Digital Audio - Basic Audio Compression Techniques - MPEG Audio compression

Lossy and Lossless Compression: Lossless Compression Algorithms - Lossy Compression Algorithms - Image Compression Standards

Video Compression: Basic Video Compression techniques- MPEG Video Coding I: MPEG 1 and 2 - MPEG Video Coding II: MPEG 4, 7 and beyond


TEXT BOOKS:

REFERENCE BOOKS:

WAVELET TRANSFORMS AND ITS APPLICATIONS

Theory : 4 Periods  Sessionals : 30
Exam : 3 Hrs.  Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:

1. To understand the basics of different transforms and to make students understand the basic notion of joint time-frequency and time-scale representations of signals
2. To understand the mathematical basis of the Wavelet transform as a tool in signal and Image analysis.
3. To introduce Multi Resolution Analysis (MRA) framework
4. To explore connections between Multi-rate DSP, Filter banks and Wavelet Transform
5. Extension to 2D, Bi-orthogonal wavelets and Wavelet packets
6. To study and appreciate Wavelet applications in Signal compression and De-noising

COURSE OUTCOMES:

Upon completion of the course, the student will be able to
1. Understand the various transforms and their applications.
2. Understand the relationship between various versions of Wavelet transform.
3. Apply Wavelet transforms to different applications.

SYLLABUS

Continuous And Discrete Wavelet Transform: Continuous time ;wavelets transform (CWT): Definition, CWT as a correlation, Constant Q factor filtering interpretation and time frequency resolution, CWT as an operator, Inverse CWT, Discrete Wavelet Transform: Approximations of vectors in Nested Linear Vector Subspaces – Multiresolution analysis (MRA) with examples.


TEXT BOOK:


REFERENCE BOOKS:

STATISTICAL SIGNAL PROCESSING

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:

1. Introduce the basic theory of signal detection and estimation.
2. Explain the Study of identifying the engineering problems that can be put into the frame of statistical signal processing.
3. Explain the Study of solving the identified problems using the standard techniques learned through this course.
4. Study the fundamental understanding of statistical signal processing that may help students study advanced topics and consequently make significant contributions to the theory and the practice of statistical signal processing.

COURSE OUTCOMES:

At the end of the course the student will have

1. Ability to characterize an estimator.
2. Ability to design statistical DSP algorithms to meet desired needs.
3. Ability to apply vector space methods to statistical signal processing problems.
4. Ability to understand Wiener filter theory and design discrete and continuous Wiener filters.
5. Ability to understand Kalman Filter theory and design discrete Kalman filters.

SYLLABUS


Bayesian Estimation: Introduction, Prior Knowledge and Estimation, Choosing a prior PDF, Properties of the Gaussian PDF, Bayesian Linear Model, Nuisance Parameters, Bayesian Estimation for Deterministic Parameters, Derivation of Conditional Gaussian PDF.


Deterministic Signals, Matched Filters, Generalized Matched Filters, Multiple Signals, Linear Model, Signal Processing Examples, Random Signals, Estimator Correlator, Linear Model, Estimator Correlator for Large Data Records, General Gaussian Detection, Signal Processing Example.

TEXT BOOKS:


REFERENCE BOOKS:

DIGITAL SIGNAL PROCESSING LAB

Lab : 4 Periods
Exam : 3 Hrs.
Sessionals : 50
Ext. marks : 50
Credits : 2

COURSE OBJECTIVES:

1. Use the Fast Fourier Transform in a variety of applications including: signal analysis, fast convolution, spectral and temporal interpolation, and filtering.
2. Quickly choose and design FIR and IIR digital filters
3. Estimate power spectral densities using a variety of techniques.
4. Perform the deconvolution of two signals
5. Construct & Simulate a simple digital communication system.
6. To learn LPC Speech coding, JPEG image compression, Image Encryption & Watermarking, apply convolutional coding & Viterbi algorithm

COURSE OUTCOMES:

1. Analyze signals using the discrete Fourier transform (DFT)
2. Understand circular convolution, its relationship to linear convolution, and how linear convolution can be achieved via the discrete Fourier transform.
3. Understand the Decimation in time and frequency FFT algorithms for efficient computation of the DFT.
4. Alter the sampling rate of a signal using decimation and interpolation.
5. Design digital IIR filters by designing prototypical analog filters and then applying analog to digital conversion techniques such as the bilinear transformation.

LIST OF EXPERIMENTS:

1. Implementation of Edge Detection Techniques using DSP processor
2. Development of Digital Data Scrambler for speech signals
3. Development of Digital Data Descrambler for speech an audio signal
4. Implementation of convolution encoder
5. Implementation of convolution viterbi decoder
6. Design and implementation of Digital Filters
7. Implementation of Digital filters for real time applications
8. Implementation JP&G algorithm for image compression
9. Implementation of Adaptive filters
10. Implementation real time system for biomedical signal using DSP processors
11. Application Development using DSP processor for Multi channel telephony system
12. Application Development for voice recognizing systems using DSP processors
REFERENCE BOOKS:

The viva-voce for the seminar shall be held with the faculty member, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 40, 20 and 40 percent by the members respectively.
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

M.TECH (COMMUNICATION SYSTEMS)

Scheme of Instruction and Examination
(Regulation: R16)
(with effect from 2016-2017 admitted batch onwards)

III – SEMESTER

<table>
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</table>

1. Candidates can do their thesis 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.

2. The Thesis Work - Preliminary 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, External Examiner, PG coordinator and guide. The marks shall be awarded in the ratio of 20, 40, 20 and 20 percent by the members respectively.
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
M.TECH (COMMUNICATION SYSTEMS)

Scheme of Instruction and Examination
(Regulation: R16)
(with effect from 2016-2017 admitted batch onwards)

IV – SEMESTER

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1. 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.
2. The Thesis should be submitted at the end of 4th semester and it will be evaluated through Viva–Voce examination by a committee consisting of Head of the Department, External Examiner, PG coordinator and thesis guide. The marks shall be awarded in the ratio of 20, 40, 20 and 20 percent by the members respectively.
## I - SEMESTER

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### #1-Elective-I

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<td>Power System Modeling</td>
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<td>M16 PS 1107</td>
<td>Power System Planning</td>
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ADVANCED POWER SYSTEM OPERATION AND CONTROL

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:

1. To understand the economics of power system operation with thermal and hydro units
2. To realize the requirements and methods of real and reactive power control in power system
3. To be familiar with the power system security issues and contingency studies

COURSE OUTCOMES:

Upon completion of this course, students will be able to

1. Develop generation dispatching schemes for thermal and hydro units
2. Apply control and compensations schemes on a power system
3. Adopt contingency analysis and selection methods to improve system security

SYLLABUS


Unit Commitment Solution Methods:

Hydro-thermal co-ordination: Hydro electric plant models–short term hydro thermal scheduling problem-gradient approach.

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.


The control problem: The two-area system, Tie-line Bias control; steady state Instabilities: Torsional Oscillatory Modes-Damper windings and negative damping, effect of AVR loop: AGC Design using kalman method-state variable form of the dynamic model, Optimum control Index, state Trajectories, the RICCATTI equations, preventive and emergency control, computer control.
TEXTBOOKS:

REFERENCE BOOKS:
COURSE OBJECTIVE:
1. To learn essential optimization techniques for applying to day to day problems.

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

SYLLABUS


Classical Optimization Techniques: Introduction, Single variable optimization, Multi variable optimization with no constraints; Multi variable optimization with Equality constraints–Solution by Direct Substitution method, Method of constrained variation, Method of Lagrangian multipliers; Multi variable optimization with in equality constraints: Kuhn-Tucker conditions.


Non-Linear Programming-II: Constrained optimization-Characteristics of a Constrained Problem, Sequential linear programming, Basic approach in the methods off easible directions, Zoutendijk’s method off easible directions, Sequential Quadratic Programming.

TEXT BOOKS:

REFERENCE BOOKS:
ADVANCED DRIVES & CONTROL

COURSE OBJECTIVES:

1. To Study about the transfer functions of D.C motors
2. To Study about the dq equivalent circuits of induction and synchronous motors.
3. To introduce the P and PI Control for controlling the DC and AC Motors.

COURSE OUTCOMES:

1. Student can design the transfer functions and obtain the performance of d.c motors
2. Student can design the dq equivalent circuits of induction and synchronous motors and evaluate the performance it.
3. Student can design the values of P and PI Controllers for controlling the DC and AC Motors

SYLLABUS

DC drives: System model, motor rating, motor mechanism dynamics, drive transfer function, effect of armature current wave form, torque pulsations, adjustable speed drives, chopper fed and single-phase converter fed drives, effect of field weakening.

Induction Motor drives: Basic Principle of operation of 3 Phase motor, equivalent circuit, MMF space harmonics due to fundamental current, fundamental spatial MMF distributions due to time harmonics simulation, effect of time and space harmonics, speed control by varying stator frequency and voltage, impact of non sinusoidal excitation on induction motors, variable square wave VSI drives, variable frequency CSI drives, line frequency variable voltage drives.

Induction Motor drives: Review of induction motor equivalent circuit, effect of voltage, frequency and stator current on performance of the machine, effect of harmonics, dynamic d- q model, small signal model, voltage and current fed scalar control, direct and indirect vector control, sensor less vector control, direct torque and flux control.

Synchronous motor drives: Review of synchronous motor fundamental, equivalent circuit, dynamic d- q model, synchronous reluctance, sinusoidal and trapezoidal back emf permanent magnet motors, sinusoidal SPM machine drives, trapezoidal SPM machines drives, wound field machine drives, switched reluctance motor drives.

Closed loop control: Motor transfer function-P, Pland PID controllers, current control-Design procedure, phase locked loop (PLL) control-microcomputer control.

TEXT BOOKS:
REFERENCE BOOKS:

ADVANCED CONTROL SYSTEM DESIGN

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COURSE OBJECTIVES:

1. Design of Linear Control Systems
2. MIMO Control design
3. PID Controller
4. State space analysis
5. Integral square error compensation
6. State feedback compensation
7. Design of digital control system

COURSE OUTCOMES:

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

1. Design the controllers for linear continuous systems using frequency domain, time domain, state feed compensation and ISE compensation
2. Design the controllers for discrete-time systems using Z-plane and W-plane method
3. Design the PID controller using Ziegler Nicholas tuning method
4. Design the MIMO Control design

SYLLABUS

**Design of Linear Control Systems:** Review of compensation techniques to obtain desired performance, Reshaping of Bode & Root locus plots to obtain desired response, Initial condition and forced response, a simple lag–lead design.

**Integral-square error compensation:** parameter optimization using Integral-square error criterion with and without constraints, principles of State variable Feedback compensation of continuous-time and discrete-time systems, simple problems to understand the concept.

**MIMO Control design:** Principles of Linear Quadratic Optimal Regulators, Discrete Time Optimal Regulators, Observer Design, Linear Optimal Filters, State Estimate Feedback, Transfer Function Interpretation, simple problems to understand the concept.

**PID Controller:** PID controller, Simulation of multi-loop control system using P, PI, PD, PID controller, Standard compensator structures (P, PD, PI and PID control).

TEXT BOOKS:

REFERENCE BOOKS:
RENEWABLE ENERGY SYSTEMS

Code: M16 PS 1105

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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


**TEXT BOOKS:**


**REFERENCE BOOKS:**

COURSE OBJECTIVES:

1. To enable the students to understanding of power system components.
2. To understand the concept of 2-axis representation of an Electrical machine.
3. To understand the importance of 3-phase to 2-phase conversion.
4. To know the representation of 3-phase induction motor in various reference frames.
5. To know the modelling of 3-phase synch. Motor in 2-axis representation.
6. To know the modelling Transmission line, SVC and load.

COURSE OUTCOMES:

At the end of the course student able to

1. Model the synchronous and induction machine by using different reference frame theories.
2. Model the Transmission line, SVC and load.

SYLLABUS

Modelling of Power System Components: The need for modelling of power system, Simplified models of non-electrical components like boiler, steam & hydro-turbine & governor system. Transformer modelling such as auto-transformer, tap-changing & phase-shifting transformer.


Transmission line, SVC and load modelling: Transmission line, d-q transformation using μ-b variables, static VAR compensators, loads modelling.

TEXT BOOKS:

REFERENCE BOOKS:
COURSE OBJECTIVES:

1. The course is designed to teach load forecasting, power system planning, and reliability issues in power system.
2. It aims to arm the students with the concepts of evaluation of generation and transmission system reliability and their impacts on system planning.
3. To learn the automation analysis for expansion of existing generation and transmission system planning.

COURSE OUTCOMES:

After completing the Power System and Automation course,
1. Students will be able to perform load forecasting for better planning of system.
2. Graduates are able to know the reliability of power system and do planning accordingly.
3. Graduates can carry out overall energy planning by automation.

SYLLABUS

Introduction: The electric utility industry, generation systems and transmission systems.

Load forecasting: Classification and characteristics of loads, approaches to load forecasting, load forecasting methodology, energy forecasting, peak demand forecasting, non-weather sensitive forecast (NWSF), weather sensitive forecast, total forecast.

Generation system reliability analysis: Probabilistic generating unit models, probabilistic load models, effective load, reliability analysis of an isolated system and interconnected systems.

Generation system cost analysis: Cost analysis, corporate models, production analysis, production costing, fuel inventories, energy transactions and off-peak loading, environmental cost.

Transmission system reliability analysis: Deterministic contingency analysis, probabilistic transmission system, reliability analysis, capacity state classification by subsets, subset decomposition for system LOLP and (DNS) calculations, single area and multi area reliability analysis.

Automated transmission system expansion planning: Basic concepts, automated network design, automated transmission planning, a DC method, automated transmission planning by interactive graphics.
TEXT BOOKS:

REFERENCE BOOKS:
1. Power System Planning’ by H.M. Merrill, CRC Press.
POWER SYSTEM SIMULATION LAB-I

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

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.

COURSE OUTCOMES:

1. Graduate will demonstrate the ability to identify, formulate and solve Power System engineering problems.
2. Graduate will demonstrate the ability to design and conduct experiments, analyze and interpret data.
3. Graduates will demonstrate the ability to design a electrical systems or process as per needs and specifications.
4. Graduate will demonstrate the skills to use modern engineering tools, softwares and equipment to analyze problem.

LIST OF EXPERIMENTS:

1. Series RLC circuit
2. MATLAB Program to Simulate Ferranti Effect.
3. MATLAB Program to Model Transmission Lines.
4. MATLAB Program to Form Y bus by Singular Transformation
5. MATLAB Program to Solve Load Flow Equations by Gauss-Seidel Method
7. MATLAB Program to Find Optimum Loading of Generators with Penalty factors.
8. MATLAB Program to Solve Swing Equation.
10. Simulink Model for Two Area Load Frequency Control
REFERENCE BOOKS:

4. Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers’ by Rudra Pratap, Oxford University Press, 2010
The viva-voce for the seminar shall be held with the faculty member, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 40, 20 and 40 percent by the members respectively.
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
M.TECH (POWER SYSTEMS AND AUTOMATION)

Scheme of Instruction and Examination
(Regulation: R16)

(with effect from 2016-2017 admitted batch onwards)

II – SEMESTER

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POWER SYSTEM DYNAMICS AND STABILITY

COURSE OBJECTIVES:
At the end of the course the student is expected to
1. Give basic knowledge about the dynamic mechanisms behind angle and voltage stability problems in electric power systems, including physical phenomena and modelling issues.
2. Learn the concepts of Dynamics, Stability, Excitation and SMIB of Power Systems.
3. Learn the modeling of synchronous machine, Excitation systems and Transmission lines.
4. Do simulation of system dynamics.
5. Learn the requirements of power system modeling and stability
6. Learn problem solving techniques for existing problems in power systems.

COURSE OUTCOMES:
At the end of this course, Students will be able to analyse and understand the electromagnetic and electromechanical phenomena taking place around the synchronous generator.

1. Will be able to solve the reactive power problems in power system
2. Will learn the concepts of Dynamics, Stability, Excitation and SMIB of Power Systems.
3. Will be able to do machine modeling.
5. Will be able to understand the effect of excitation system on small signal stability.
6. Understand the significance of power system stabilizer in power system stabilities.

SYLLABUS


Dynamics of a Synchronous generator connected to infinite bus: System model, synchronous machine model, Application model (1.1), Calculation of initial conditions, System simulation, Consideration of other machine models, Inclusion of SVC model.

Small Signal Stability Analysis: Analysis of single machine system, small signal analysis with block diagram representation, Characteristic equation and application of Routh-Hurwitz criterion, synchronizing and damping torque analysis, small signal model state equations.

Application of Power System Stabilizers: Introduction, Basic concepts in applying PSS, Control signals, structure and tuning of PSS.

Analysis of Multi-machine system: As implied system model, detailed models, Case I and II, Inclusion of load and SVC dynamics, modal analysis of large power systems.
TEXT BOOKS:
2. Power system control and stability by P.M. Anderson and A. A. Fouad, Ezalgotia publications

REFERENCE BOOKS:
AUTOMATION IN POWER SYSTEMS

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COURSE OBJECTIVES:
1. To know what are the elements of automatic power control systems.
2. To clearly understand the role of central control room management and operations in the DA solution.
3. To familiarize with Supervisory control and data acquisition (SCADA).
4. To gain the awareness of the problems and challenges of the present day distribution sector.
5. To gain the knowledge of Principles of Distribution Automation (DA)
6. To gain the knowledge of various communication technologies available for DA.
7. To clearly understand the Technical Benefits of automation of distribution system.

COURSE OUTCOMES:

At the end of the course, the student will be able to
1. Learn various activities of central control room management.
2. Understand about SCADA
3. Gain the knowledge on application of automation to distribution system.

SYLLABUS

**Introduction:** Purpose of automatic power control systems, elements of automatic power control systems, automatic power control and controllers relays and relaying devices.

**Operation and control:** Operations environment of distribution networks, evolution of distribution management systems, basic distribution management system functions, basis of a real-time control system (SCADA), data acquisition, monitoring and event processing, control functions, data storage, archiving, and analysis, hardware system configurations, SCADA system principles.

**Distribution automation:** Problems with existing distribution system, need for distribution automation, characteristics of distribution system, distribution automation, feeder automation.

**Substation automation:** Definition, functions of substation automation state and trends of substation automation, intelligent affordable substation monitoring and control.

**Feeder automation:** Losses in distribution systems, system losses and loss reduction, network reconfiguration, improvement in voltage profile, capacitor placement for reactive power compensation, Algorithm for location of capacitor.
TEXT BOOKS:
1. Automation in Electrical power systems by, P.I. Zabolotny, MIR Publishers, Moscow

REFERENCE BOOKS:
1. Sunil S. Rao, Switch gearand Protections, Khanna Publication
2. Stuart A Boyer: SCADA supervisory control and data acquisition, ISA
3. Gordon Clark, Deem Reynders, Practical Modem SCADA Protocols
INTELLIGENT SYSTEMS AND CONTROL

COURSE OUTCOMES:
1. To introduce the students with the concepts of learning methods.
2. To provide students with the artificial neural networks and their architecture.
3. To familiarize the students with the various applications of artificial neural networks.
4. To introduce the concepts of the fuzzy logic control and their real time applications.

COURSE OBJECTIVES:
1. Define the advances in neural networks
2. Evaluate the design and control of fuzzy systems.
3. Articulate the applications of fuzzy control block sets.
4. Evaluate the design of various models in neural networks
5. Techniques for analyzing of various types of neural networks
6. Evaluate the design and control of associative memories
7. Techniques to Design fuzzy logic system
8. Learn the unified and exact mathematical basis as well as the general principles of various soft computing techniques.
9. Provide detailed theoretical and practical aspects of intelligent modeling, optimization and control of non-linear systems.
10. Prepare the students for developing intelligent systems through case studies, simulation examples and experimental results.

SYLLABUS

Neural Networks: Artificial Neural Networks: Basic properties of Neurons, Neuron Models, Feed forward networks–Perceptrons, Multilayer networks–Exact and approximate representation, Back propagation algorithm, variants of Back propagation, Unsupervised and Reinforcement learning; Competitive learning and self organizing networks, Hybrid Learning.


Fuzzy Logic: Overview of classical logic, Fuzzy sets vs Crispset, Membership function, Methods of Membership function, Value Assignment, Defuzzification–Methods of defuzzification, fuzzy rule based and Approximation, Aggrigation of Fuzzy rules, Fuzzy inference system –Mamadani and Sugeno methods.


**TEXT BOOKS:**

1. Bose and Liang, Artificial Neural Networks, Tata Mcgraw Hill, 1996.

**REFERENCE BOOKS:**

8. Fuzzysystems, Fuzzylogic, fuzzy systems by – loft Asker Zadeh
9. TimothyJ Ross – Fuzzy Logic with Emergency Applications
OPTIMAL CONTROL THEORY

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COURSE OBJECTIVES:

1. To give exposure to problem formulation and performance measures for different type of optimal control problems.
2. To introduce concepts needed to solve optimal controller using Dynamic Programming Approach and H-J-B equation.
3. To introduce concepts of functional, variation of functional, the fundamental theorem of calculus of variation to solve simplest variational problem.
4. To introduce concepts needed to solve linear regulatory problem using Pontryagin’s minimum principle.
5. To introduce concept of iterative numerical techniques needed to solve two-point boundary value problems using steepest descent algorithm.

COURSE OUTCOMES:

After completing this course the students should be able to:

1. Have familiarity with problem formulation and different forms of performance measures as applied to variety of optimal control problems.
2. Apply optimal control law and dynamic programming computational procedure to solve optimal control problems.
3. Apply Hamilton-Jacobi-Bellman equations to solve linear regulator problem
4. Have complete familiarity with Calculus of Variation.
5. Have familiarity with Pontryagin’s minimum principle.
6. Apply numerical techniques like steepest descent algorithm to determine optimal trajectories.

SYLLABUS


The variational approach to optimal control problems: Necessary conditions for optimal control-Linear regulator problem-Pontryagin's minimum principle and state inequality constraints.

Iterative numerical techniques for finding optimal controls: Two-point boundary-value problems-The method of steepest descent-Features of the steepest descent algorithm.

TEXT BOOKS:

REFERENCE BOOKS:
HIGH VOLTAGE AC/DC TRANSMISSION

Theory : 4 Periods  
Exam : 3 Hrs.  
Sessionals : 30  
Ext. Marks : 70  
Credits : 4

COURSE OBJECTIVES:

1. To learn HVAC and HVDC transmission systems.
2. To analyse phenomenon’s of Lightning, Travelling waves and switching Transients.
3. To have an idea about Protection Devices in HVAC Transmission.
4. To design filters for reduction of harmonics.
5. To Model and analyse AC and DC systems interaction.

COURSE OUTCOMES:

At the end of the course students will be able:

1. To understand the basic concepts of EHV AC and HVDC transmission.
2. To identify the electrical requirements for HVDC lines.
3. To identify the components used in AC to DC conversion.
4. To understand the operation of HVDC conversion technology.
5. To understand the fundamental requirements of HVDC transmission line design.
6. To identify factors affecting AC-DC transmission.
7. To Design Filters for reduction of harmonics and Become familiarize with the use of protection equipment

SYLLABUS

EHVAC Transmission: Principles, configuration, special features of high voltage AC lines, power transferability, reactive power compensation, audible noise, corona, electric field, right of way, clearances in a tower, phase to phase, phase to ground, phase to tower, factors to be considered, location of ground wire.

Lightning, Travelling waves and switching Transients: Mathematical model to represent lightning-Travelling wave in transmission lines-Circuits with distributed constants-Wave equations-Reflection and Refraction of travelling waves-Travelling waves at different line terminations-effect of short length of cables-Shape and attenuation and distortion of travelling waves-Switch intransient -the circuit closing transient-the recovery transient initiated by the removal of the short circuit.

Protective device in HVAC transmission: Basic ideas about protection-surge diverters-surge absorbers- ground fault neutralizers-Protection of lines and stations by shielding-Ground wires–counterpoises-Driven rods- Modern lightning arrestors.

**Bridge converters-Analysis, Control, Protection and Harmonics Filters:** Converter/Inverter circuits for HVDC Transmission-basic means of control–Power reversal-desired features of control–actual control characteristics. Converter disturbance by pass action in bridges-commutation failure-basics of protection-DC Reactors-Voltage and current oscillations-Circuit breakers-Over voltage protection-Characteristics and non-characteristic harmonics-design of ac and dc filters.

**Modeling and analysis of AC and DC systems interaction:** System models, application of switching functions, torsional interactions with HVDC systems, harmonic interaction, control interaction.

**TEXT BOOKS:**

1. Allen Greenwood, `Electrical Transients in power system’, Wiley Inter science, 1971
2. EHV AC Transmission by Rakosh Das Begamudre, New Age Publishers

**REFERENCE BOOKS:**

2. Diesendorf,W., `Over voltage on High voltage system’ Rensselaer Book store, Troy, New York, 1971
6. HVDC Transmission- Adamson C. Hingorani N.G.
7. Power Transmission by DC UhimannE.
8. HVAC and HVDC Transmission, Engineering and practice : S.Rao, Khanna Publisher, Delhi.
POWER QUALITY

COURSE OUTCOMES:
1. Understand the various power quality issues, their origin, and monitoring and mitigation methods.
2. To understand the power quality problems like voltage sag, swell, flickers, harmonics etc.
3. Understand the effects of various power quality phenomenon in various equipment.
4. To know the knowledge on voltage standard characteristics, PQ survey etc.

SYLLABUS

Introduction: Introduction of the Power Quality (PQ) problem, Terms used in PQ: Voltage, Sag, Swell, Surges, Harmonics, over voltages, spikes, Voltage fluctuations, Transients, Interruption, overview of power quality phenomenon, Remedies to improve power quality, power quality monitoring


Short Interruptions: Short interruptions – definition, origin of short interruptions, basic principle, fuse saving, voltage magnitude events due to re-closing, voltage during the interruption, monitoring of short interruptions, difference between medium and low voltage systems. Multiple events, single phase tripping– voltage and current during fault period, voltage and current at post fault period, stochastic prediction of short interruptions.

Voltage sag–characterization–Single phase/Three-phase: Voltage sag–definition, causes of voltage sag, voltage sag magnitude, monitoring, theoretical calculation of voltage sag magnitude, voltage sag calculation in non radial systems, meshed systems, voltage sag duration. Three phase faults, phase angle jumps, magnitude and phase angle jumps for three phase unbalanced sags, load influence on voltage sags

Power Quality and EMC Standards: Introduction to standardization, IEC Electromagnetic compatibility standards, European voltage characteristics standards, PQ surveys
TEXT BOOKS:

REFERENCE BOOKS:
POWER ELECTRONIC APPLICATIONS IN POWER SYSTEMS

**COURSE OBJECTIVES:**
1. To enable the students acquire a comprehensive ideas on various aspects of FACTS systems.
2. To acquire the knowledge on Flexible AC Transmission System and its importance for FACTS devices.
3. To understand the various FACTS controllers operation on FACTS systems.
4. To Gain Knowledge about STATCOM.

**COURSE OUTCOMES:**
After completion of the course, the student will be able to

1. Understand the importance of FACTS controllers and its benefits.
2. Know the objectives of shunt, series compensations and role of FACTS devices on system stability, voltage control.
3. Analyze the functional operation and control of SVC and STATCOM.
4. Describe the principle, operation and control of SPST.

**SYLLABUS**

**Introduction:** Basics of Power Transmission Networks - Control of Power Flow in AC Transmission Line- Flexible AC Transmission System Controllers, Basic types of FACTS Controllers, Brief Descriptions and Definitions of FACTS Controllers. Benefits from FACTS technology, HVDC vs. FACTS.

**Static shunt compensators:** SVC and STATCOM:- Objectives of Shunt compensation, Methods of controllable VAR generation, Static VAR compensators: SVC and STATCOM, comparison between SVC and STATCOM, Static VAR systems.

**Static Synchronous Compensator (STATCOM):** Introduction-Principle of Operation of STATCOM-A Simplified Analysis of a Three Phase Six Pulse STATCOM-Analyis of a Six Pulse VSC Using Switching Functions-Multi-pulse Converters Control of Type 2 Converters-Control of Type1Converters-Multi level Voltage Source Converters- Harmonic Transfer and Resonance in VSC Applications of STATCOM

**Static Phase Shifting Transformer:** General-Basic Principle of a PST-Configurations of SPST Improvement of Transient Stability Using SPST -Damping of Low Frequency Power Oscillations - Applications of SPST

**Static Series compensators:** GCSC, TSSC, TCSC and SSSC:- Objectives of series compensation, Variable impedance type series compensators, Switching converter type series compensators, External(System) Control for Series Reactive Compensators, Summery of Characteristics and Features.
TEXT BOOKS:


REFERENCE BOOKS:

POWER SYSTEM SIMULATION LAB-II

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

COURSE OBJECTIVES:
1. To Simulate and compare the various aspects economic load dispatch and load flows.
2. To Simulate and observe the stability studies of transient and steady state.
3. To simulate and observe behaviour of a system during the Short circuit.
4. To Conduct experiments on a given system to know performance when subjected to various faults.
5. To Conduct experiments on different types of relays.

COURSE OUTCOMES:
1. The student will be able to validate the adaptability of economic load dispatch and load flow for a given situation by simulation results.
2. Design a controller for FACTS application by simulation.
3. Demonstrate the effects of different sequence reactance of a synchronous machine by experimentation.
4. Acquainted with the characteristics of different relays by experimentation.
5. Know how to use the simulation software to design a real time power system.

LIST OF EXPERIMENTS:
1. Implementing the newton Raphson method for load flow using matlab.
2. Load flow analysis by Decoupled method using matlab.
3. Load flow analysis by fast Decoupled method using matlab.
4. Obtain positive and negative sequences under un symmetrical fault analysis using matlab.
5. Solve the dynamics of synchronous machine using matlab.
6. Obtain Swing curves of a synchronous machine for a 3 phase fault.
7. Optimal load frequency control of a two area system.
8. Obtain the transient and subtransients of a synchronous generators.
9. Obtain the sequence impedences of the transmission lines.
10. Improving voltage profile by using series compensation.
11. Design of statcom.

REFERENCE BOOKS:
4. Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers’ by Rudra Pratap, Oxford University Press, 2010
SEMINAR-II

Lab : 3 Periods
Exam : 3 Hrs.

Sessionals : 100
Credits : 2

The viva-voce for the seminar shall be held with the faculty member, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 40, 20 and 40 percent by the members respectively.
1. Candidates can do their thesis 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.

2. The Thesis Work - Preliminary 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, External Examiner, PG coordinator and guide. The marks shall be awarded in the ratio of 20, 40, 20 and 20 percent by the members respectively.
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING  
M.TECH (POWER SYSTEMS AND AUTOMATION)  
Scheme of Instruction and Examination  
(Regulation: R16)  
(with effect from 2016-2017 admitted batch onwards)

IV – SEMESTER

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Scheme of Examination</th>
<th>Exam Marks</th>
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<td>Thesis Work-Final</td>
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<td>Viva-voce</td>
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1. 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.
2. The Thesis should be submitted at the end of 4th semester and it will be evaluated through Viva–Voce examination by a committee consisting of Head of the Department, External Examiner, PG coordinator and thesis guide. The marks shall be awarded in the ratio of 20, 40, 20 and 20 percent by the members respectively.
DEPARTMENT OF INFORMATION TECHNOLOGY
M.TECH (INFORMATION TECHNOLOGY)
Scheme of Instruction and Examination
(Regulation: R16)
(with effect from 2016-2017 admitted batch onwards)

I – SEMESTER

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course title</th>
<th>Credits</th>
<th>Lecture Hrs</th>
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<tr>
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<td>Mathematical Foundations of Computer Science</td>
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<td>Data Structures &amp; Algorithms</td>
<td>4</td>
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<td>M16 CST 1103</td>
<td>Advanced Data Base Management Systems</td>
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<td>M16 CST 1104</td>
<td>Advanced Operating Systems</td>
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Total: 28 Lecture Hrs, 24 Lab Hrs, 6 Total Contact Hrs/Week, 30 Sessional Marks, 520 Exam Marks, 800 Total Marks

<table>
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<th>Course Code</th>
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<tbody>
<tr>
<td>M16 IT 1101</td>
<td>Computer Organization &amp; Architecture</td>
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<tr>
<td>M16 IT 1102</td>
<td>E-Commerce</td>
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<td>M16 IT 1103</td>
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<td>M16 IT 1104</td>
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<td>M16 IT 1105</td>
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<td>M16 IT 1106</td>
<td>Compiler Design</td>
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#1-Elective-I

#2-Elective-II

<table>
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<tr>
<td>M16 IT 1107</td>
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<td>M16 IT 1108</td>
<td>Cloud Computing</td>
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<td>M16 IT 1109</td>
<td>Grid Computing</td>
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<td>M16 IT 1110</td>
<td>Computer Graphics &amp; Visual Computing</td>
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<tr>
<td>M16 IT 1111</td>
<td>Parallel Programming</td>
</tr>
<tr>
<td>M16 IT 1112</td>
<td>Computer Vision</td>
</tr>
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</table>
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(Common for M.Tech (CST, IT))

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:
1. Presenting the theory of finite automata, as the first step towards learning advanced topics, such as compiler design.
2. Applying the concepts learned in fundamental courses such as Discrete Mathematics, in a theoretical setting; in particular, the application of proof techniques.
3. Discussing the applications of finite automata towards text processing.
4. Developing an understanding of computation through Turing Machines

COURSE OUTCOMES:
1. Critical, logical-mathematical reasoning
2. Ability to apply mathematical knowledge and logic in solving problems.
3. Understanding of formal grammar analysis and compilation.

SYLLABUS
Mathematical notions of sets, sequences and tuples, functions and relations, Primitive recursive functions, computable functions, examples, graphs, strings and languages.

Boolean logic – properties and representation, theorems and types of proofs, deductive, inductive, by construction, contradiction and counter-examples.

Introduction to Number theory, Divisibility, modular arithmetic (addition modulo and multiplication modulo); Statements and applications of Euler and Fermat Theorems, Primitive Roots, Discrete Logarithms, Primality Test, Finding Large primes, Definition of Elliptic Curves and their applications to Cryptography.

Introduction To Finite Automata: Alphabets and languages- Deterministic Finite Automata – Non-deterministic Finite Automata – Equivalence of Deterministic and Non-Finite Automata – Languages Accepted by Finite Automata – Finite Automata and Regular Expressions – Properties of Regular sets &Regular Languages and their applications.


Turing Machines: The Definition of Turing Machine – Computing with Turing Machines – Combining Turing Machines, , programming techniques for Turing Machines.

Variants of Turing Machines, Restricted Turing Machines Universal Turing Machines. The Halting Problem, Decidable & undecidable problems- Post Correspondence Problems

TEXT BOOKS:
1. Introduction to Automata Theory, Languages and Computations – J.E. Hopcroft, & J.D. Ullman, Pearson Education Asia.
REFERENCE BOOKS:

1. Introduction to languages and theory of computation – John C. Martin (MGH)
2. Discrete Mathematical structures with application to Computer Science – J.P. Tremblay and R. Manohar, Mcgraw Hill Education
3. Introduction to Theory of Computation – Michael Sipser (Thomson Nrools/Cole)
COURSE OBJECTIVES:
1. Student will learn about advanced data structures and the algorithms for manipulating them, and how to analyze the time and memory requirements of them.
2. 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.
3. Student will learn when and how to use techniques for developing algorithms, such as divide-and-conquer and dynamic programming.
4. Student will also become skilled in algorithmic analysis and algorithm development using the latest techniques.

COURSE OUTCOMES:
1. 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 and how they are implemented in ‘C’ programming language.

SYLLABUS
Algorithm Analysis: Overview of C++ classes, pointers, parameters passing, templates, using Matrices, Basics of time complexity estimates, General norms for running time calculation

Lists, Stacks & Queues: Abstract Data Types, Representation & implementation of ADT list, Doubly linked list, Circular linked lists, Representation, Implementation and applications of ADT stack and Queue.


Hashing: Hash Function, Separate chains, Open addressing, rehashing, Extendible Hashing.

Internal Sorting Algorithms: Sorting like insertion Sort, shell Sort, Heap Sort, Merge Sort, Quick Sort and Simple external Sorting algorithm.

Disjoint Set: Equivalence Relations, Find and Union algorithms an dynamic sets, Path compression and Union-by-Rank algorithm analysis.

TEXT BOOK:

REFERENCE BOOKS:
ADVANCED DATA BASE MANAGEMENT SYSTEMS
(Common for M.Tech (CST, IT))

<table>
<thead>
<tr>
<th>Theory</th>
<th>: 4 Periods</th>
<th>Sessionals</th>
<th>: 30</th>
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<td>Exam</td>
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<td>Ext. Marks</td>
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<tr>
<td></td>
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<td>Credits</td>
<td>: 4</td>
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COURSE OBJECTIVES:
1. To interpret an entity relationship diagram (ERD) to express requirements and demonstrate skills to model data requirements and create data models into normalized designs
2. To use SQL to create database objects, populate tables, and retrieve data
3. To describe the causes of performance problems and how to improve database application performance
4. To develop a working understanding of database systems theory in order to apply that knowledge to any particular database implementation.

COURSE OUTCOMES:
1. Understanding of DBMS.
2. Design database using ER model and refine the design by enforcing functional dependencies, integrity constraints and normalization
3. Write queries using SQL
4. Implement procedures and triggers

SYLLABUS


Query Evaluation: Overview, Query processing, Query optimization, Performance Tuning.

Database System Architectures: Centralized and Client-Server Architecture, Server system Architecture, Parallel and Distributed database, Object based databases and XML. Advanced data types in databases. Cloud based data storage systems.


Case Studies: Postgre SQL, Oracle, IBM DB2 Universal Database, Microsoft SQL Server.

TEXT BOOKS:

REFERENCE BOOKS:
ADVANCED OPERATING SYSTEMS
(Common for M.Tech (CST, IT))

Theory : 4 Periods
Exam : 3 Hrs.

Sessionals : 30
Ext. Marks : 70
Credits : 4

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

COURSE OUTCOMES:
Students understands the concept of Distributed systems, Process Synchronization, File structure and shared memory in Distributes operating systems

SYLLABUS


Distributed Systems & Synchronization: Clock Synchronization, Logical Clocks, Mutual Exclusion, Global Positioning Of Nodes, Data-Centric Consistency Models, Client-Centric Consistency Models, Consistency Protocols.

TEXT BOOKS:

REFERENCE BOOKS:
COURSE OBJECTIVES:
Understand the architecture of a modern computer with its various processing units. Also the performance measurement of the computer system. In addition to this the memory management system of computer.

COURSE OUTCOMES:
1. Students can understand the architecture of modern computer.
2. They can analyze the Performance of a computer using performance equation
3. Understanding of different instruction types.
4. Students can calculate the effective address of an operand by addressing modes
5. They can understand how computer stores positive and negative numbers.
6. Understanding of how a computer performs arithmetic operation of positive and negative numbers.
7. Understanding of how computer stores floating point numbers in IEEE 754 standard.
8. Cache memory and its importance.
9. Students can understand how cache mapping occurs in computer and can solve various problems related to this.
10. Secondary storage organization and problem solving

SYLLABUS

Register Transfer and Micro operations:
Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design:
Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

Micro programmed Control:
Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

Central Processing Unit:
Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer(RISC)

Input/output Organization:
Peripheral Devices, I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor (IOP), Serial Communication.
Memory Organization:
Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory, Memory Management Hardware.

Overview of Computer Architecture:

TEXT BOOKS:

REFERENCE BOOKS:
E-COMMERCE

Theory : 4 Periods
Exam : 3 Hrs.

Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:
1. To understand process models
2. E - payments
3. Credit Cards smart cards
4. E - documents
5. E - Business logic

COURSE OUTCOMES:
1. Student able to understand advertising, marketing process on the internet and be familiar with the e-commerce services

SYLLABUS


Electronic Payment Systems – Types of Electronic Payment Systems, Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment Systems, Designing Electronic Payment Systems Electronic Data Inter Change, Inter Organizational Commerce - EDI, EDI Implementation, Value Added Networks.


Business to consumer e-commerce: On line Marketing and Selling, Information Goods, Electronic Markets and Auctions on the Internet

E-Business Intelligence: Data Mining, Web Merchandising and Recommender Systems, Intelligent Agents in e-commerce, Business-to-Business e-commerce and Supply Chain Management

Security of Internet Hosts and Networks, Public Key Infrastructure, Safety of e-commerce Applications
TEXT BOOKS:

REFERENCE BOOKS:
EMBEDDED SYSTEMS

**COURSE OBJECTIVES:**

1. To understand the architecture embedded systems
2. To know Embedded system software design
3. Design, execution and evaluation of experiments on embedded platforms.
4. Analysis, design and testing of systems that include both hardware and software.
   Identification and synthesis of solutions for embedded system problems

**COURSE OUTCOMES:**

1. An ability to design systems, components, or processes for broadly-defined engineering technology problems.
2. Implement combinatorial logic and sequential systems in terms of basic digital building blocks using simulation software. You will be able to perform some optimisations.
3. Design, test and critically evaluate embedded solutions to real world situations using digital components (combinatorial and combinatorial).
4. Recognize the key features of embedded systems in terms of computer hardware and be able to discuss their functions. You will be aware of the key factors affecting computing hardware evolution.
5. Develop software systems for embedded devices using assembler code

**SYLLABUS**


**Tasks and Task States** – Tasks and Data – Semaphores and Shared Data – Semaphore Problems – Semaphore variants.


**RTOS design** – Principles – Encapsulation Semaphores and Queues – Hard Real-Time Scheduling Considerations – Saving Memory Space – Saving Power.

**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:


REFERENCE BOOK:

COURSE OBJECTIVES:
1. The course objectives include: overview of digital image processing field; understand the fundamental digital image processing algorithms and implementation; gain experience in applying image processing algorithms to real problems.
2. Cover the basic theory and algorithms that are widely used in digital image processing
3. 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, and their use in frequency domain filtering.
4. Demonstrated understanding of the fundamental image enhancement algorithms such as histogram modification, contrast manipulation, and edge detection.

SYLLABUS

Image Transforms: A Detail Discussion On Fourier Transform, DFT, FFT, Properties WALSH Trans Form, WFT, HADAMARD Transform, DCT.

Image Enhancement:
- Arithmetic and Logical Operations, Pixel or Point Operations, Size Operations,
- Smoothing Filters-Mean, Median, Mode Filters – Comparative Study
- Edge Enhancement Filters – Directorial Filters, Sobel, Laplacian, Robert, KIRSCH Homogeneity
- & DIFF Filters, Prewitt Filter, Contrast Based Edge Enhancement Techniques – Comparative Study
- Low Pass Filters, High Pass Filters, Sharpening Filters. – Comparative Study
- Colour Fundamentals and Colour Models
- Colour Image Processing.


Image Compression: Run Length Encoding, Contour Coding, Huffman Code, Compression Due to Change in Domain, Compression Due to Quantization Compression at the Time of Image Transmission. Brief Discussion on:- Image Compression Standards.
**Image Segmentation:** Characteristics of Segmentation, Detection of Discontinuities, Thresholding Pixel Based Segmentation Method. Region Based Segmentation Methods, Segmentation by Pixel Aggregation, Segmentation by Sub Region Aggregation, Histogram Based Segmentation, Spilt and Merge Technique, Motion in Segmentation

**Morphology:** Dilation, Erosion, Opening, Closing, Hit-And-Miss Transform, Boundary Extraction, Region Filling, Connected Components, Thinning, Thickening, Skeletons, Pruning Extensions to Gray – Scale Images Application of Morphology in I.P

**Image , Video & Multimedia Communications:** Multi-scale and multi-orientation representation; Geometry and texture representation; Object based representation; Hierarchical representation; Sparse representation, Multimedia with image and video content; Multimedia event synchronization.

**TEXT BOOK:**
1. Digital Image Processing, Rafael C. Gonzalez And Richard E. Woods, Addision Wesley

**REFERENCE BOOKS:**
ARTIFICIAL INTELLIGENCE

Code: M16 IT 1105

Theory : 4 Periods  
Exam : 3 Hrs.  
Sessionals : 30  
Ext. Marks : 70  
Credits : 4

COURSE OBJECTIVES:
1. To introduce different artificial intelligence techniques
2. To learn different machine learning algorithms
3. Learn different recent algorithms in artificial intelligence

COURSE OUTCOMES:
1. Able to learn artificial intelligence techniques
2. Understand the concept of machine learning.

SYLLABUS


Machine Learning: Knowledge and Learning, Learning by Advise, Examples, Learning in problem Solving, Symbol Based Learning, Explanation Based Learning, Version Space, ID3 Decision Based Induction Algorithm, Unsupervised Learning, Reinforcement Learning, Supervised Learning; Perceptron Learning, Back propagation Learning, Competitive Learning, Hebbian Learning.
Natural Language Processing: Role of Knowledge in Language Understanding, Approaches Natural Language Understanding, Steps in The Natural Language Processing, Syntactic Processing and Augmented Transition Nets, Semantic Analysis, NLP Understanding Systems; Planning: Components of a Planning System, Goal Stack Planning, Hierarchical Planning, Reactive Systems

TEXT BOOKS:
1. Artificial Intelligence, George F Luger, Pearson Education Publications

REFERENCE BOOKS:
1. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI
3. Artificial Intelligence : A modern Approach, Russell and Norvig, Printice Hall
COMPILER DESIGN

Theory : 4 Periods  
Exam : 3 Hrs.

Sessionals : 30  
Ext. Marks : 70  
Credits : 4

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 learn the new code optimization techniques to improve the performance of a program in terms of speed & space.
3. To use the knowledge of patterns, tokens & regular expressions

SYLLABUS


**Code Generation:** Issues in Code Generation, Input to Code Generator, Instruction Selection, Register Allocation, Simple Target Machine Model, Program and Instruction Costs, Register allocation & Assignments, Code Generation Algorithm, Code Generators, Optimal Code Generation for Expressions, Code Generation From DAG.

**Symbol Table Management,** Contents of a Symbol Table, Data Structures for Symbol Tables; Run time Environments, Implementation of a simple Stack allocation, Heap Management, Block Structured Languages; Error Detection & Recovery, Lexical Phase Errors, Syntactic & Semantic Errors, Error Handling Routines.

**Code Scheduling & Case Studies:** Instruction Scheduling, Speculative Loads & Boosting, Speculative Scheduling, Software Pipe Lining, Trace Scheduling, Percolation Scheduling, Case Studies: Sun Compilers, SPARC, IBM XL Compiler for the POWER& Power PC , Digital Equipment Compiler for Alpha, Intel Reference Compilers, Future Trends In Compiler Design and Implementations.

**TEXT BOOKS:**
2. Advanced Compiler Design and Implementation, Steven Muchnic, Elsevier Publications

**REFERENCE BOOKS:**
COURSE OBJECTIVES:

1. Build an understanding of the fundamental concepts of computer networking.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
3. Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
4. Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual 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. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
4. Identify the different types of network devices and their functions within a network.
5. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

SYLLABUS


Data Link Control, Error Detection & Correction, Sliding Window Protocols, LANs & MANs: IEEE Standards for LANs & MANs-IEEE Standards 802.2, 802.3, 802.4, 802.5, 802.6, High Speed LANs.


Network Devices: Over View of Repeaters, Bridges, Routers, Gateways, Multiprotocol Routers, Brouters, Hubs, Switches, Modems, Channel Service Unit CSU, Data Service Units DSU, NIC, Wireless Access Points, Transceivers, Firewalls, Proxies.

TEXT BOOK:

REFERENCE BOOKS:
2. Computer networks, Mayank Dave, CENGAGE.
COURSE OBJECTIVES:

1. To impart fundamental concepts in the area of cloud computing
2. To impart knowledge in applications of cloud computing

COURSE OUTCOMES:

1. Understanding the systems, protocols and mechanisms to support cloud computing
2. Develop applications for cloud computing
3. Understanding the hardware necessary for cloud computing
4. Design and implement a novel cloud computing application

SYLLABUS


Software as a Service - Overview, Driving Forces, Company Offerings, Industries Software plus Services - Overview, Mobile Device Integration, Providers, Microsoft Online.

Developing Applications - Google, Microsoft, Intuit QuickBase, Cast Iron Cloud, Bungee Connect, Development, Troubleshooting, Application Management.

Local Clouds and Thin Clients - Virtualization in Your Organization, Server Solutions, Thin Clients, Case Study: McNeilus Steel.


TEXT BOOK:


REFERENCE BOOK:

GRID COMPUTING

Theory : 4 Periods
Exam : 3 Hrs.

Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:

1. Understand the need for and evolution of Grids in the context of processor- and data-intensive applications
2. Be familiar with the fundamental components of Grid environments, such as authentication, authorization, resource access, and resource discovery
3. Know architecture of grid computing
4. Be able to justify the applicability, or non-applicability, of Grid technologies for a specific application

COURSE OUTCOMES:

1. To understand the genesis of grid computing
2. To know the application of grid computing
3. To learn the technology and tool kits for facilitating grid computing

SYLLABUS


Architecture: Architecture of Grid and Grid Computing, Review of Web Services-OGSA-WSRF.


Grid Middleware: List of globally available Middlewares - Case Studies-Recent version of Globus Toolkit and gLite - Architecture, Components and Features.


TEXT BOOKS:

REFERENCE BOOKS:
COMPUTER GRAPHICS & VISUAL COMPUTING

Theory : 4 Periods  
Exam : 3 Hrs.  
Sessionals : 30  
Ext. Marks : 70  
Credits : 4

COURSE OBJECTIVES:
1. To Learn basic and fundamental computer graphics techniques
2. To Learn image synthesis techniques
3. Examine applications of modeling, design and visualization
4. Learn different color modeling and computer animation
5. Learn hierarchical modeling and graphing file formats
6. Learn viewing pipeline and structures
7. To Learn visualization and computational and mathematical methods of visual computing
8. To understand visual transformation and projection

COURSE OUTCOMES:
Students able to
1. Learn basic and fundamental computer graphics techniques
2. Represent and implement images and objects using 3D representation.
3. Design develop surface detection using various detection methods
4. Choose various illumination models for provides effective standards of objects
5. Design of develop effective computer animations
6. Design of various projections

SYLLABUS


Three Dimensional Concepts and Object representations: 3D display methods-3D Graphics, Polygon Surfaces, Curved Lines and Surfaces, Quadratic Surfaces, Super Quadrics, Blobby Objects, Spline Representations, Cubic Spline methods, Bézier Curves and Surfaces, B Spline Curves and Surfaces.

Composite Transformations, 3D Transformation Functions, Modeling and Coordinate Transformations,

**Viewing Pipeline and structures**: Viewing Coordinates, Projections, View Volumes, General Projection Transformations, Clipping, Hardware Implementations, Concepts of Structures and Basic models, Editing, Hierarchical Modeling with Structures.

**Visualization**: Three Dimensional Viewing, Visualization- Image Processing- The viewing Pipeline, Viewing Coordinate Reference Frame, Window-to-Viewport Coordinate Transformation, Two Dimensional Viewing Functions, Clipping Operations, Point Clipping, Line Clipping, Polygon Clipping-Curve Clipping, Text and Exterior Clipping.

**Visual Computing**: Computational and mathematical methods for creating, capturing, analyzing and manipulating digital photographs, Introductory Topics on computer graphics, computer vision, and machine learning, Programming assignments intended to give hands-on experience with creating graphical user interfaces, and with implementing programs for synthesizing and manipulating photographs.


**TEXT BOOKS:**


**REFERENCE BOOKS:**

PARALLEL PROGRAMMING

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks : 70
Credits : 4

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.
4. Analytical modeling and performance of parallel programs.
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 and implement them on available parallel computer systems.
3. Reconstruction of emerging parallel algorithms with MPI. Compute contemporary parallel algorithms.

SYLLABUS

Introduction to Parallel Computing: Parallel Programming and Parallel Computing, Overview of Parallel Architectures and Parallel Programming Models, MIMD and SPMD Models, Problems Unique to Parallel Programming,

Supercomputers and Grand Challenge Problems: Modern Parallel Computers, Data Dependence Graph, Data Parallelism, Functional Parallelism, Pipelining and Data Clustering.

Interconnection Networks: Switch Network Topologies, Direct and Indirect Network Topology, Bus, Star, Ring, Mesh, Tree, Binary Tree Network, Hyper Tree Network, Hybrid, Hypercube, Perfect Shu E Network, Torus and Butterfly Network.


Introduction To Parallel Algorithms: Parallel Programming Models, PVM, MPI Paradigms.

Parallel Programming Languages: Brents Theorem, Simple Parallel Programs in MPI Environments, Parallel Algorithms on Network, Addition of Matrices, Multiplication of Matrices.

TEXT BOOKS:
2. Parallel Programming in C with MPI and Open MP, Michael J. Quinn, McGraw Hill, 2004
REFERENCE BOOKS:

1. Introduction to Distributed and Parallel Computing, Crichlow, PHI.
3. Introduction to Parallel Processing, Shashi Kumar M et al., PHI New Delhi.
5. The Design and Analysis of Parallel Algorithms, S.G.Akl, PHI.
**COMPUTER VISION**

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**COURSE OBJECTIVES:**

1. The fundamentals of Computer Vision.
2. Computer vision is to develop the theoretical and algorithmic basis by which useful information about the world can be automatically extracted and analyzed from a single image or a set of images.
3. Image processing techniques, feature extraction techniques, imaging models and camera calibration techniques, stereo vision, and motion analysis.

**COURSE OUTCOMES:**

1. Students demonstrate a thorough understanding of fundamental concepts in computer vision.
2. Students must be able to design and conduct experimental validation for a computational approach to a computer vision problem, and interpret the results to assess the performance.
3. Students are familiar with methods used in various vision-based applications – image feature detection, 3-D reconstruction, segmentation.

**SYLLABUS**


**Shape Representation and Descriptions (Part - 1):** Region Identification, Algorithms for Region Identification, Shape Representation and Description - Chain Codes, Geometric Border Representation - Boundary Length, Curvature, Bending Energy, Signature, Chord Distribution, Fourier Transforms of Boundaries, Boundary Description using Segment Sequences, B-Spline Representation, Shape invariants.


TEXT BOOKS:
1. Pattern Recognition and Image Analysis, Earl Gose, Richard Johnsonbaugh, Steve Jost, PHI

REFERENCE BOOK:
1. Introduction to Artificial Neural Networks, S.N. Sivanandam, M. Paul Raj, VIKAS
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.

COURSE OUTCOMES:
At the end of this course student able to implement
1. Linear data structures
2. Non-linear data structures
3. Sorting and searching techniques

SYLLABUS

Implementation of Data Structures and Algorithms using C++
1. To perform various operations such as insertion, deletion, display on single linked lists.
2. To implement
   (i) Stacks using linked list.  (ii) Queues using linked list.
3. To perform different types of searching techniques on a given list
   (i) Sequential search (ii) Binary search (iii) Fibonacci search
4. To perform different types of sortings on a given list
   (i) Bubble sort (ii) Insertion sort (iii) Selection sort(iv) Merge sort
5. To perform different types of sortings on a given list
   (i) Quick sort (ii) Shell sort (iii) Radix sort
6. To perform the following
   (i) To convert the given infix expression to postfix expression
   (ii) To evaluate the given postfix expression.
7. To perform various operations on graphs
   (i) Vertex insertion. (ii) Vertex deletion.
   (iii) Edge insertion.  (iv) Edge deletion.
   (v) Breadth First traversal. (vi) Depth First traversal.
8. To implement dictionaries using hashing technique
9. To perform various operations on binary heap.
10. To perform various operations on Binary search tree.
11. To perform operations on AVL trees.
12. To perform various operations on B-tree.
REFERENCE BOOKS:

COURSE OBJECTIVES:
1. To teach the graduate database design and query and PL/SQL.

COURSE OUTCOMES:
Student able to
1. Create Small applications using databases, Retrieve information from databases by using queries
2. Implement procedures and triggers

SYLLABUS

Accessing the Database: The first laboratory exercise is to connect to a database, populate it with data, and run very simple SQL queries. (Data Definition, Table Creation, Constraints, Insert, Select Commands, Update & Delete Commands.)

Basic SQL: This lab covers simple SQL queries. (Inbuilt functions in RDBMS.)

Intermediate SQL: This lab covers more complex SQL queries. (Nested Queries & Join Queries, Control structures)

Advanced SQL: This lab covers even more complex SQL queries. (Procedures and Functions, PL/SQL, Cursors and Triggers)

Database Access from a Programming Language: This lab introduces you to database access from a programming language such as Java or C#. Although phrased using Java/JDBC, the exercise can be done using other languages, OBDC or ADO.NET APIs.

Building Web Applications: This lab introduces you to construction of Web applications. Although phrased using the Java Servlet API, the exercise can be done using other languages such as C# or PHP.

Project: Each student is assigned with a problem. The student is to develop a logical and physical database design for the problem and develop Forms, Menu design and Reports.
A. The logical design performs the following tasks:
   1. Map the ER/EER diagrams to a relational schema. Be sure to underline all primary keys, include all necessary foreign keys and indicate referential integrity constraints.
   2. Identify the functional dependencies in each relation
   3. Normalize to the highest normal form possible
B. Perform physical design based above logical design using Oracle/MSSQL on Windows platform and MySQL/PostgreSQL on Linux platform.

SAMPLE TERM PROJECTS:
1. Retailer database
2. Automobile sales database
3. Electronics vendor database
4. Package delivery database
5. Real estate database
REFERENCE BOOKS:

2. ORACLE PL/SQL by example. Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rd Edition
3. ORACLE Database Log PL/SQL Programming Scott Urman, TMG Hill.
4. SQL & PL/SQL for Oracle 10g, Black Book, Dr. P.S. Deshpande.
# II – SEMESTER

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<td>M16 IT 1205</td>
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<td>M16 IT 1215</td>
<td>Data warehousing &amp; Data Mining</td>
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WEB SYSTEMS & TECHNOLOGIES

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:

1. To understand the advanced technologies of java JDBC, ASP, Servlets, EJB etc.
2. To design and Develop Servlets to Handle Server-side Exceptions.
3. To design applications using databases
4. To design beans using EJB

COURSE OUTCOMES:

1. Student knows about the advanced Java and design applications using Database Design Applications and web pages for personal, Educational and business purposes.
2. Develop mobile computing applications based on the paradigm of context aware computing and wearable computing

SYLLABUS

Introduction: History of the Internet and world wide web and HTML, Basic Internet Protocols-HTTP, SMTP, Pop3, Mime, IMAP, Introduction to scripting Languages-Java Scripts, Object based Scripting for the web structures, functions, arrays and Objects, Dynamic HTML with Java Script

Dynamic HTML: Introduction to Object references, Dynamic Style, Dynamic Position, Frames, Navigators, Event Models, On Check, On load, Mouse operations, Adding Shaddows, Creating Images, Creating Gradients, Creating Motion with Blur, Data binding, Sorting Table data, Binding of Images And Table.


Java Beans: Introduction to Java Beans, Advantages of Java Beans, BDK; Introspection, Using Bound properties, Bean Info Interface, Constrained properties; Persistence, Customizes, Java Beans API, Introduction to EJB’s


**JSP Application Development**: Generating Dynamic Content, Using Scripting Elements
Implicit JSP Objects, Conditional Processing, Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data Between JSP pages, Requests, and Users Passing Control and Date between Pages, Sharing Session and Application Data – Memory Usage Considerations

**TEXT BOOKS:**
1. Web Programming, building internet applications, 2/e, Chris Bates, Wiley Dreamtech
2. The complete Reference Java 2 ,5/e, Patrick Naughton , Herbert Schildt. TMH
3. Programming world wide web-Sebesta, PEA

**REFERENCE BOOKS:**
1. Internet , World Wide Web , How to program, Dietel , Nieto, PHI/PEA
2. Jakarta Struts Cookbook , Bill Siggelkow, S P D O’Reilly
3. Web Tehnologies, 2/e, Godbole, kahate, TMH,202,
4. An Introduction to web Design , Programming ,Wang,thomson
5. Web Applications Technologies Concepts-Knuckles, John Wiley
OBJECT ORIENTED SOFTWARE ENGINEERING
(Common for M.Tech (CST, IT))

Theory : 4 Periods
Exam : 3 Hrs.

Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:
1. To understand the Object oriented modelling using UML
2. To enable the student to get knowledge in SDLC (Analysis design, code and testing)
3. Introducing the various design approaches, models and metrics.
4. Understanding of Software Project Management including Planning/scheduling.
5. Emphasis on Black box, white box testing strategies

COURSE OUTCOMES:
1. Student Knows about the techniques of planning and monitoring the progress of a software project.
2. Project management and cost estimation techniques
3. Be familiar with software development team architectures

SYLLABUS


**Requirements Engineering:** Domain Analysis, Problem Definition And Scope, Requirements Definition, Types Of Requirements, Techniques For Gathering And Analyzing Requirements, Requirement Documents, Reviewing, Managing Change In Requirements.


Case Study:

a. Simple Chat Instant Messaging System
b. GPS Based Automobile Navigation System
c. Waste Management Inspection Tracking System (WMITS)
d. Geographical Information System

TEXT BOOK:

1. Object-Oriented Software Engineering Practical software development using UML and Java by Timothy C. Lethbridge & Robert, Langaniere Mcgraw-Hill

REFERENCE BOOKS:

INFORMATION SECURITY AND CRYPTOGRAPHY

Theory : 4 Periods
Exam : 3 Hrs.

Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:
1. Identify and prioritize information assets.
2. Identify and prioritize threats to information assets.
3. Define an information security strategy and architecture.
4. Plan for and respond to intruders in an information system.
5. Describe implications of security and privacy issues.
6. Present a disaster recovery plan for recovery of information assets after an incident.

COURSE OUTCOMES:
Student can know about
1. Identify and prioritize information assets, threats
2. Define an information security strategy and architecture.
3. Plan for and respond to intruders in an information system and plan for recovery of information assets after an incident.

SYLLABUS

Introduction: Introduction to Security, Security Approaches, Principles of Security; Security Services and Mechanism-confidentiality, Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability; 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.


Symmetric Key Cryptographic Algorithms: Overview of symmetric Key Cryptography Algorithm types and modes; DES, IDEA, RC5, BLOWFISH, AES Algorithms; Differential and Linear Cryptanalysis.

Asymmetric Key Cryptographic Algorithms: Overview of Asymmetric Key cryptography, RSA Algorithm, Symmetric and Asymmetric Key Cryptography Together, Digital Signature, Knap sack Algorithm and other Algorithms.

**Practical Implementation of Cryptography & Security:** Cryptographic Solutions using Java, Cryptographic Solutions Using Microsoft, Cryptographic Tool Kit, Security and Operating Systems Pretty Good Privacy (PGP) and S/MIME.

**TEXT BOOKS:**


**REFERENCE BOOKS:**

3. Network Security - Private Communication in a Public World, Charlie Kaufman, Radia Perlman, Mike Speciner, PEA PHI.
COURSE OBJECTIVES:
1. To understand the basics of Mobile wireless Networking
2. To learn the role of Wireless networks in Mobile
3. To expose to the concept of Adhoc networks

COURSE OUTCOMES:
At the end of the course the student should be able to
1. Know various mobile wireless network
2. Know different Adhoc networks
3. Know about mobile data network
4. Work out security measures in Adhoc

SYLLABUS

Introduction: Introduction to Wireless Networks, Various Generations of Wireless Networks, Virtual Private Networks- Wireless Data Services, Common Channel Signaling, Various Networks for Connecting to the Internet, Blue tooth Technology, Wifi-WiMax-Radio Propagation mechanism, Pathloss Modeling and Signal Coverage

Wireless Local Area Networks: Introduction-WLAN topologies-IEEE 802.11 Standards, MAC Protocols, Comparison of 802.11 a,b,g and n Standards, HIPER LAN, ZigBee 802.15.4, Wireless Local Loop


Mobile Data Networks: Location/mobility management, Mobile IP, Dynamic routing protocols, Location-based protocols, Emerging topics: sensor networking, Data-Oriented CDPD network, GPRS and higher data rates, Short messaging service in GSM.

TEXT BOOKS:

REFERENCE BOOK:
MATHEMATICS OF INTERNET SYSTEMS & CONTROL

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**COURSE OBJECTIVES:**

Understands the basic network and its graphs of internet systems and helps to find out the high throughput of a network. The student can learn different congestion control algorithms and can know parallel and distributed computation techniques.

**COURSE OUTCOMES:**

1. Able to know web basics and algorithms
2. Able to understand structure of internet search engine
3. Able to know real-time sources
4. Able to compute real time search engine

**SYLLABUS**

**Introduction:** Basics of Networks & Graphs: Random growth of graphs, adjacency matrix and power laws, The Internet Graph, The Web Graph, Graph Communities and the Web, Basics of Probability and algorithms: Computational Complexity, Exponential problems, decidability, compressing & hashing, Randomized algorithms, randomness and humans, Resource sharing between elastic & inelastic users

**Design and Control of communication networks:** Randomly fluctuating demands and failures by adapting rates, rerouting of network traffic & reallocating resources

**Rate Control algorithms for Internet:** Stability & fairness, economic issues, scalable models for simulation, Concepts in Congestion avoidance & Control, Maximizing throughput of network & Minimizing packet-loss ratio for Networks

**Linear Analysis with Delay:** Primal Controllers-High Throughput TCP and AVQ, Dual Algorithm, Primal Dual Algorithm, Exponentially smoothed rate feedback, Proportionally-fair controller

**Congestion Control Algorithms for Internet:** Algorithms for single link and single flow-Window Flow Control, Random early detection (RED), explicit congestion notification (ECN), High throughput TCP, stochastic and deterministic models in congestion control, Resource allocation for congestion control

**Anatomy of Internet Search Engine:** Basic Data Structure, Crawling the Web, Page Relevance and Ranking, Answering the user queries, Role of distributed & parallel computing internet Browsers and search engines: Caching web pages, browsers and search engines, DNS tree, File sharing on internet

**Parallel and distributed Computation:** Basic rules of cooperation, logical problems on working in parallel, distributed world, routing methods

**Real-time Sources and Distributed Control:** Probing & Distributed Admission Control, Queuing Model at Link Buffer, Diffusion Approximation-Brownian Motion Through a Queu
TEXT BOOKS:
2. The Mathematics of Internet Congestion Control (Systems and Control: foundations and Applications), Birkhauser Boston, 2003

REFERENCE BOOK:
COURSE OBJECTIVES:

1. Document the different phases in the life cycle of an IT infrastructure project.
2. Gather background information and research and describe its impact on the project.
3. Describe and explain the main features of project evaluation.

COURSE OUTCOMES:

At the end of the course
1. Able to find out primary issues of a project.
2. Able to find out different operations in a project.
3. Able to handle a project without any problems.

SYLLABUS

Introduction to Infrastructure Planning and Management: Computer Basics, Network and Internet, Computing Resources, Information Technology, IT Infrastructure Management, Challenges in IT Infrastructure Management


Virtualization: Desktop Virtualization Applications, Remote Desktop Services, Terminal Services, Server Virtualization, Selecting the right Virtualization Technology, Dynamic Datacenter

System Center: System Center Service Manager, System Center Data Protection Manager, System Center Virtual Machine Manager, System Center Operations Manager, System Center Configuration Manager, Dynamic Datacenter

Storage Management: Introduction to Storage, Backup and Storage, Archive and Retrieve, Disaster Recovery, Space Management, Database and Application Protection, Bare Machine Recovery, Data Retention, Microsoft SQL Server/Database Server


Case Study: Any Case Study Consisting of (Eg. Asset Network Incorporation)- IT Service Continuity Management, Capacity Management, Availability Management, Configuration Management, Incident Management, Problem Management, Storage Management, Identity Management
TEXT BOOK:
1. IT Infrastructure & Its Management, Guptha, TMH

REFERENCE BOOKS:
1. Infrastructure planning and design-microsoft
2. Selecting the right virtualization Technology by-Microsoft inc
3. IPD in the Technet Library
4. IPD in the Microsoft Partner Network
5. Microsoft Solution Accelerator
GEO INFORMATICS

<table>
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COURSE OBJECTIVES:

1. To learn the basic concepts of geo-informatics in brief that includes Geographical Information System (GIS), Remote Sensing (RS), and Global Positioning System (GPS).
2. To learn the data needs and database development analysis in GIS environment.
3. To understand various applications of GIS

COURSE OUTCOMES:

1. Graduates will demonstrate the ability to model and development of application in Geospatial arena interpret and analyze data, and report results.
2. Graduates will demonstrate the ability to develop Geospatial system that meets desired specifications and requirements
3. Graduates will demonstrate an understanding of their professional and ethical responsibilities.

SYLLABUS

**Introduction:** Definition of GIS and Related Terminology—Evolution of GIS—Components of GIS—Approaches to study of GIS Maps and GIS: Map Scale—Classes of maps—The mapping Process—Plane coordinate systems and Transformations—Geographic Coordinate System of Earth—Map Projection—Establishing a spatial framework for mapping Locations on Earth—Geo-referencing—Acquisition of Spatial Data for the terrain—Topographic Mapping—Attribute Data for Thematic Mapping

**Digital Representation of Geographic Data:** Technical Issues Pertaining to Digital Representation of Geographic Data—Database creation and management—Raster Geographic and Vector data representation—Object oriented Geographic Data representation—Relationship between Data representation and Data Analysis in GIS Data Quality and Data Standards: Concepts and Definitions of Data Quality—Components of Geographic Data Quality—Assessment of Data Quality—Managing Spatial Data Errors—Geographic Data Standards—Geographic Data Standards And GIS Development

**Raster and Vector-Based GIS Data Processing:** Acquiring and Handling Raster Data Processing Cartographic Modeling—Characteristics of Vector-Based GIS Data Processing Vector Data Input Functions—Non-topological GIS Analysis Functions Feature-Based Topological Functions—Layer-Based Topological Functions—Vector-Based Output Functions—Application Programming

**Visualization of Geographic Information and Generation:** Cartography in the Context of GIS—Human-Computer Interaction and GIS—Visualization of Geographic Information Principles of Cartographic Design in GIS—Generation of Information Products

**Digital Terrain Modeling:** Definitions and Terminology Approaches to Digital Terrain Data Sampling- Acquisition of Digital Terrain Data-Data Processing, Analysis, and Visualization-Applications of Digital Terrain Models.

**Spatial Analysis and Modeling:** Descriptive Statistics-Spatial Auto Correlation- Quadratic Counts and Nearest-Neighbor Analysis-Trend Surface Analysis-Gravity Models-Network Analysis-GIS Modeling


**TEXT BOOK:**


**REFERENCE BOOKS:**

1. An Introduction to Geographical Information Systems, by Ian Heywood, Sarah Cornelium & Steve Carver, Pearson Education
COURSE OBJECTIVES:
1. To understand the basic concepts of database security.
2. To learn security issues and solutions
3. To understand threats to learn how to perform data encryption.
4. To understand Enterprise Security Policy

COURSE OUTCOMES:
1. Able to understand the database security framework
2. Will be able to learn database access control
3. Will be able to understand database security techniques.
4. Will be able to implement security for databases.

SYLLABUS


Database Security Solutions: Maintaining Data Integrity, Protecting Data, Controlling Data Access, Combining Optional Security Features, Compliance Scanner, Policy Trends in Database Control, Watermarking: Copyright Protection, Trustworthy Record Retention and Recovery, Privacy-Preserving Data Mining & Data Publishing, Privacy in Location-Based Services

Database Auditing: Auditing Database Users, User Privileges And Objects: Monitoring for Suspicious Activity, Standard Database Auditing, Setting the AUDIT_TRAIL, Specifying Audit Options, Viewing Auditing Options, Auditing the SYSDBA Users, Audit to XML Files, Value-Based Auditing, Auditing DML Statements, Triggering Audit Events, Maintaining the Audit Trail
**Database Privileges And Roles:** Authorization, Privileges, Benefits of Roles, Using Proxy Authentication With Roles, Creating An Enterprise Role, Securing Objects and Application Roles, Data Masking Primitives And Routines, Privacy in Location-Based Services

**Data Encryption For Database Security:** Problems Solved by Encryption, Storing the Key in Database, Key Management by User, Application-Based Encryption, Cipher Block Modes, Hash and Message Authentication Code, Transparent Data Encryption (TDE) & File Encryption Methods.

**TEXT BOOKS:**


**REFERENCE BOOKS:**

BUSINESS INTELLIGENCE

<table>
<thead>
<tr>
<th>Theory</th>
<th>: 4 Periods</th>
<th>Sessionals</th>
<th>: 30</th>
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<tr>
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<td>Ext. Marks</td>
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</tr>
<tr>
<td>Credits</td>
<td></td>
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</tr>
</tbody>
</table>

COURSE OBJECTIVES:

1. Use various symbolic knowledge representation to specify domains and reasoning tasks of a situated software agent.
2. Use different logical systems for inference over formal domain representations, and trace how a particular inference algorithm works on a given problem specification.
3. Understand the conceptual and computational trade-offs between the expressiveness of different formal representations.

COURSE OUTCOMES:

1. Understand different types of AI agents
2. Know various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms)
3. Understand the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving
4. Ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems

SYLLABUS

**Introduction to Artificial Intelligence:** Artificial Intelligence, AI Problems, AI Techniques, Defining the Problem as a State Space Search, Problem Characteristics, Production Systems, Search: Issues in The Design of Search Programs, Un-Informed Search and Heuristic Search Techniques & Algorithms. AI Applications in Biology, Engineering, Technology and Business

**Knowledge Representation:** Knowledge General concepts, Representations & Approaches to Knowledge Representation, Forward Vs Backward Reasoning, Symbolic Logic: Computable Functions and Predicates, FOPL Representation of knowledge, Normal Forms, Unification and Resolution, Basic Inference Techniques; Structured Representation of Knowledge: Semantic Nets, Partitioned Semantic Nets, Frames, Conceptual Dependency, Conceptual Graphs, Scripts, CYC


**Business Analytics For BI:** Data Warehouse Architecture: OLAP, Data Cubes, Reporting Tools, Balance Scorecard, Dash Board design and Implementations, Data Mining And Analytical Tools, Multidimensional/Hyper Cubes, Enterprise Data – Enterprise Data And Information Flow. Information Management and Regulatory Compliance Case Studies:


**BI Tools and Intelligent Agents:** Overview of Intelligent agents, Design and Implementation of Intelligent Agent system, languages and Tools, Multi-Agent systems; Applications in Adaptive Information Retrieval systems, Decision Support Systems, BI Reporting Tools-BIRT, Pentaho, Integration with mysql server, Knowledge Discovery Systems, Agents in Computational Biology, Smart Systems and Robots.

**Case Studies in Business Intelligence:** Business model development from marketing, finance domains-Dimensional modeling, metrics, DataCube creation. Data visualization through BI tools for OLAP operation. Publishing BI reports in Enterprise portals.

**TEXT BOOKS:**

1. Artificial Intelligence : A modern Approach, Russell and Norvig, Printice Hall
2. Decision Support and Business Intelligence Systems, Efraim Turban, Ramesh Sharda, Jay Aronson, David King, , Pearson Education, 2009

**REFERENCE BOOKS:**

1. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI
4. Artificial Intelligence, George F Luger, Pearson Education Publications
COURSE OBJECTIVES:
1. To provide advanced knowledge and skills in the field of Computer Science and Engineering.
2. Capable to quickly adapt to new technology in the field of Big Data, assimilate new information, and solve real world problems.
3. To pursue applied research in the advance field of computer science and be committed to life-long learning activities.

COURSE OUTCOMES:
On completion of the programme the graduates will
1. Be able to apply the knowledge of computing tools and techniques in the field of BigData For solving real world problems encountered in the Software Industries
2. Be able to analyze the various technologies & tools associated with Big Data.
3. Be able to identify the challenges in BigData with respect to IT Industry and pursue quality research in this field with social relevance

SYLLABUS

Introduction: Velocity, Variety, Veracity; Drivers for Big Data, Sophisticated Consumers, Automation, Monetization, Big Data Analytics Applications: Social Media Command Center, Product Knowledge Hub, Infrastructure and Operations Studies, Product Selection, Design and Engineering, Location-Based Services, Online Advertising, Risk Management

Architecture Components: Massively Parallel Processing (MPP) Platforms, Unstructured Data Analytics and Reporting: Search and Count, Context-Sensitive and Domain-Specific Searches, Categories and Ontology, Qualitative Comparisons, Data Privacy Protection, Real-Time Adaptive Analytics and Decision Engines

Advanced Analytics Platform: Real-Time Architecture for Conversations, Orchestration and Synthesis Using Analytics Engines, Entity Resolution, Model Management, Discovery Using Data at Rest, Integration Strategies

Implementation of Big Data Analytics: Revolutionary, Evolutionary, or Hybrid, Big Data Governance, Integrating Big Data with MDM, Evolving Maturity Levels


Communication Cost Models, Complexity Theory for Map-Reduce, Reducer Size and Replication Rate, Graph Model and Mapping Schemas, Lower Bounds on Replication Rate.
**Mining Data Streams:** Stream Data Model and Management. Stream Source, Stream Queries, and issues, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Ones in a Window, Decaying Windows

**Link Analysis:** PageRanking in web search engines, Efficient Computation of PageRank using Map-Reduce and other approaches, Topic-Sensitive PageRank, Link Spam, Hubs and Authorities

**TEXT BOOKS:**
1. Big Data Analytics: Disruptive Technologies for Changing the Game, Dr. Arvind Sathi,, First Edition October 2012, IBM Corporation

**REFERENCE BOOK:**
MOBILE COMPUTING

Theory : 4 Periods
Exam : 3 Hrs.

Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:

1. Introduction of an advanced element of learning in the field of wireless communication.
2. 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.

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.

SYLLABUS


WLAN Topologies, WLAN Standard IEEE 802.11, Comparison Of IEEE 802.11a, B, G and N Standards, Wireless PANs, Hiper LAN, Wireless Local Loop, ATM, Virtual Private Networks, Wireless Data Services, Common Channel Signaling, Various Networks for Connecting to The Internet.


TEXT BOOKS:

REFERENCE BOOKS:
COURSE OBJECTIVES:
1. Introduce students to soft computing concepts and techniques and foster their abilities in
   designing and implementing soft computing based solutions for real-world and
   engineering problems.
2. Explain the students about fuzzy sets and its operations,
3. Introduce students to fuzzy systems, fuzzy logic and its applications
4. Explain the students about Artificial Neural Networks and various categories of ANN.

COURSE OUTCOMES:
At the end of the course students
1. Able to understand genetic algorithm fundamentals and its operators and procedure
2. Understand artificial neural network model and its activation functions
3. Understand different operations of GA

SYLLABUS
Soft Computing: Introduction to Fuzzy Computing, Neural Computing, Genetic Algorithms,
Associative Memory, Adaptive Resonance Theory, Different Tools and Techniques,
Usefulness and Applications.
Fuzzy Sets and Fuzzy Logic: Introduction, Fuzzy Sets Versus Crisp Sets, Operations on
Fuzzy Sets, Extension Principle, Fuzzy Relations and Relation Equations, Fuzzy Numbers,
Linguistic Variables, Fuzzy Logic, Linguistic Hedges, Applications.
Interference in fuzzy logic: fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms,
Fuzzifications and Defuzzificataions, Fuzzy Controller, Fuzzy Controllers, Fuzzy Pattern
Recognition, Fuzzy Image Processing, Fuzzy Database.
Artificial Neural Network: Introduction, Artificial Neuron and its model, activation
functions, Neural network architecture: single layer and multilayer feed forward networks, re-
current networks. Various learning techniques, perception and convergence rule, Auto-
associative and hetro-associative memory, Hebb’s Learning, Adaline, Perceptron
Multilayer Feed Forward Network, Back Propagation Algorithms, Different Issues
Regarding Convergence of Multilayer Perceptron, Competitive Learning, Self-Organizing,
Feature Maps, Adaptive Resonance Theory, Associative Memories, Applications.
Evolutionary and Stochastic Techniques: Genetic Algorithm (GA), Genetic
Representations, (Encoding) Initialization and Selection, Different Operators of GA, Analysis
of Selection Operations, Hypothesis of Building Blocks, Schema Theorem and Convergence
of Genetic Algorithm, Simulated Annealing and Stochastic Models, Boltzmann Machine,
Applications.
Rough Set: Introduction, Imprecise Categories Approximations and Rough Sets, Reduction
of Knowledge, Decision Tables and Applications.
**Hybrid Systems:** Neural-Network-Based Fuzzy Systems, Fuzzy Logic-Based Neural Networks, Genetic Algorithm for Neural Network Design and Learning, Fuzzy Logic and Genetic Algorithm for Optimization, Applications

**TEXT BOOKS:**


**REFERENCE BOOKS:**

1. Artificial Intelligence and Intelligent Systems, N.P.Padhy, Oxford University Press.
CLUSTER COMPUTING

Theory : 4 Periods
Exam : 3 Hrs.

Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:
1. The course will provide an insight for achieving cost efficient high performance system.
2. The course will deal with design and architecture of cluster computing.

COURSE OUTCOMES:
At the end of the course student will
1. Have knowledge of virtual technologies and Service-oriented architecture,

SYLLABUS


Cluster Planning, Architecture, Node Hardware and Node Software, Design Decisions

Network Hardware: Internet technologies, Ethernet, cLAN, QsNet, Infiniband, Packet Format, NIC Architecture, hubs & Switches.


Clusters Management: Cluster Workload Management Activities, Queuing, scheduling and monitoring, Resource Management and Accounting

Virtualization technologies; Parallel and Virtual file systems, Introduction, Programming with parallel File systems, Benchmarks

TEXT BOOK:

REFERENCE BOOKS:
PERVASIVE COMPUTING

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:
1. Student can understand underlying technologies and applied standards for building up pervasive solutions.
2. This includes WAP, GPRS, Bluetooth, Infrared, Voice over IP, among others.
3. Expose students to latest technologies that relate to device technologies and pervasive computing, such as wearable computing and smart identification.

COURSE OUTCOMES:
At the end of the course, students should be able to:
1. Identify distinguishing features of the different mobile device categories,
2. Understand the role of the Wireless Application Protocol in enabling mobile devices to access the Internet
3. Understand elementary to medium-level (complexity-wise) user interface applications for all three platforms.

SYLLABUS


Pervasive Architecture: Background, Scalability and Availability, Pervasive Web Application Architecture, Implementation Issues.

Pervasive Devices: Device Categories, Device Characteristics, Software Components in the Device, Information Access Devices, Smart Identification, and Embedded Controls, Hand Held Computers, Cellular Phones, Smart Phones, Smart Cards and Smart Appliances


Pervasive Synchronization: Definition of Synchronization, Models of Synchronization, Challenges In Synchronizing Data, Industry Data Synchronization Standards: Infrared Mobile Communications, WAP, Third Generation Partnership Program, Syncml, Synchronization Solutions


**TEXT BOOKS:**

2. Pervasive Computing: Technology And Architecture of Mobile Internet Applications Jochen Burkhardt, Horst Henn, Stefan Hepper, Klaus Rindtorff, Thomas Schaeck

**REFERENCE BOOK:**

SEMANTIC WEB

Theory : 4 Periods
Exam : 3 Hrs.

Sessionals : 30
Ext. Marks : 70
Credits : 4

COURSE OBJECTIVES:
1. To teach the concepts, technologies and techniques underlying and making up the Semantic Web.
2. Understand and use ontologies in the context of Computer Science and the semantic web.

COURSE OUTCOMES:
1. Able to understand the rationale behind Semantic web.
2. Understand the concept structure of the semantic web technology and how this technology revolutionizes the World Wide Web and its uses.
3. Able to model and query domain knowledge as ontologies defined using standards such as RDF and OWL.

SYLLABUS


Resource Descriptive Languages RDF: Introduction to RDF, Syntax of RDF, Advanced Feature, Simple Ontologies in RDF Schema, Encoding Special Data Structures, Semantics Model Theoretic Sentics for RDFs, Syntactic Reasoning with Deduction Rules Syntactic Limits of RDFs.


Ontology Query Languages: Semantic Web Query Languages and Implementations, ROPS (RDF OWL Processing Systems), SWOPS (SWRL Ontology Processing System, Bench Marking Results, SPARQL, Query Languages for RDF, Conjunctive Queries for OWL DL).

Semantic Web Mining: Introduction, Concepts in Semantic Web Mining, XML, RDF & Web Data Mining, Ontologies and Web Data Mining, Agents in Web Data Mining, Web Mining and Semantic Web As a Data Base, semantic Interoperability and Web Mining Web Mining Vs Semantic Web Mining.
Semantic Web Tools & Applications: Web Data Exchange and Syndication, Semantic WIKI’s, Semantic Portals, Semantic Meta Data in Data formats, Semantic Web Services Modeling Ontologies, Semantic Web Service Design Tools, Ontologies for Standardizations WMO and SWMO Applications

TEXT BOOK:

REFERENCE BOOKS:
1. Web Data Mining and Applications in Business Intelligence and Counter Terrorism, Bavani Thuraisingham, CRC Press, June 2003
2. Implementing Semantic Web Services-The SESA Frame Work, D. Fensel; M. Kerrigan; M. Zaremba, Springer
3. Enabling Semantic Web Services- The Web Service Modeling Ontology, Fensel,D; Lausen,H; Pollers, ABruijn, J; Stollberg, M; Spriger
5. Programming the Semantic Web, Toby Segaran, Colin Evans, Jamie Taylor Orellly Publications, July 2009
DATA WAREHOUSING & DATA MINING

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 analyze different operations and techniques involved in data mining.

SYLLABUS

Introduction to Data Mining: Evolution of IT into DBMS, Motivation and importance of Data Warehousing and Data Mining, Kinds of Patterns, Technologies, Basic Data Analytics: Data Objects and Attributes Types, Statistical Descriptions of Data, Data Visualization, Estimating Data Similarity and Dissimilarity, Major Issues in Data Mining., Data Mining Applications

Data Warehouse and OLAP Technology: Basic Concepts of Data warehouse, Data Modeling using Cubes and OLAP, DWH Design and usage, Implementation using Data Cubes and OLAPs, Data Generalization with AOI.

Data Mining Primitives & Data Cubes: Data Mining Primitives, Data Mining Tasks, Data Mining Query Language, Designing Graphical user Interfaces based on a Data Mining Query language, Preliminary Concepts of Data Cube Computation, Data Cube Computation Methods: Multi-way Array Aggregation for Full Cube, BUC Computing for Iceberg Cubes, Star-Cubing Using Dynamic Star-Tree Structure, Pre-computing Shell Fragments for Fast High-Dimensional OLAPs.

Data Mining Concept Description: Data Preprocessing: Pre-processing the Data, Data Cleaning, Data Integration, Data Reduction, Data Transformation, Discretization and Concept Hierarchy Generation; Data Architectures of Data Mining Systems; Characterization and Comparison, Concept Description, Data Generalization and Summarization; Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons, Discriminating between Different Classes, Mining Descriptive & Statistical Measures in Large Databases.

Mining Frequent Patterns Based on Associations and Correlations: Basic Concepts, Frequent Itemset Mining Methods: Apriori Algorithm, Association Rule Generation, Improvements to A Priori, FP-Growth Approach, Mining Frequent Patterns using Vertical Data Formats, Mining Closed and Max Patterns, Pattern Evaluation Methods
**Classification:** Basic Concepts, Decision Tree Induction, Bayes Classification, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy Advanced Methods: Classification by Back Propagation, SVM, Associative Classification, Lazy Learning, Fuzzy Sets, Rough Sets, Genetic Algorithms, Multiclass Classification, Semi-Supervised Classification

**Cluster Analysis:** Basic Concepts, Types of Data in Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Evaluation of Clustering Solutions

**TEXT BOOK:**
1. Data Mining- Concepts and Techniques by Jiawei Han, Micheline Kamber and Jian Pei – Morgan Kaufmann publishers ---3rd edition

**REFERENCE BOOKS:**
1. Data Mining Techniques, A.K.Pujari, University Press Data mining concepts by Tan, Steinbech, and Vipin Kumar - Pearson Edu publishers
2. Data Mining –Introductory and Advanced by Margarett Dunham -- Pearson Education publishers
3. Data Warehousing for Real-world by Sam Annahory-- Pearson Education publishers
COURSE OBJECTIVES:

1. To local and remote systems
2. To chat application for communication between the systems
3. To retrieve data from remote system
4. To transfer data, files between the systems.
5. To design and develop applications and Web pages HTML tags, Emphasis on CSS, Servlets, cookies, JSP & EJB.

COURSE OUTCOMES:

1. Student able to design Mail Clients, HTTP server. And also data from remote systems.
2. Students design web pages using html tags.
3. Identify user and content goals of the proposed web site and create functional and formal design specifications for a site.

SYLLABUS

Part I Networks Lab  Experiments
1. Identifying well known ports on a Remote System :By trying to listen to the various well known ports by opening client connections. If the exception does not occur then the remote port is active else the remote port is inactive.

2. Writing a Chat application:
   i). One-One: By opening socket connection and displaying what is written by one party to the other.
   ii). Many-Many (Broadcast): Each client opens a socket connection to the chat server and writes to the socket. Whatever is written by one party can be seen by all other parties.

3. Data retrieval from a Remote database: At the remote database a server listens for client connections. This server accepts SQL queries from the client, executes it on the database and sends the response to the client.

4. Mail Client:
   i). POP Client : Gives the server name, user name and password retrieve the mails and allow manipulation of mail box using POP commands.
   ii). SMTP Client : Gives the server name, send e-mail to the recipient using SMTP commands.

5. Simulation of Telnet: Provide a user interface to contact well-known ports, so that client-server interaction can be seen by the user.

6. Simple file transfer between two systems (without protocols): By opening socket connection to our server on one system and sending a file from one system to another.

7. TFTP- Client: To develop a TFTP client for file transfer. (Unix Network programming-Stevens.)
8. HTTP-Server: Develop a HTTP server to implement the following commands. GET, POST, HEAD, DELETE. The server must handle multiple clients.

**Part II Web Programming Lab Experiments**

9. Design of the Web pages using various features of HTML and DHTML
10. Client server programming using servlets, ASP and JSP on the server side and java script on the client side
11. Web enabling of databases
12. Multimedia effects on web pages design using Flash.

**REFERENCE BOOKS:**

1. Java Network Programming, Harol, Orielly Publications
2. An Introduction to Computer Networking, Kenneth C. Mansfield Jr and James L. Antonakos, Pearson Education Asia
3. Internet and Web Technologies by Raj Kamal, Tata McGraw-Hill
OBJECT ORIENTED SOFTWARE ENGINEERING LAB
(Common for M.Tech (CST, IT))

Lab : 3 Periods
Exam : 3 Hrs.

Sessionals : 50
Ext. Marks : 50
Credits : 2

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. Students can design and implement complex software solutions, and test and document software.
2. They are capable of working as part of a software team and develop significant projects

SYLLABUS
1. The purpose of the Software Engineering Lab course is to familiarize the students with modern software engineering methods and tools, Rational Products. The course is realized as a project-like assignment that can, in principle, be a team of three/four students working full time. Typically the assignments have been completed during the semester requiring approximately 60-80 hours from each project team.
2. The goal of the Software Engineering Project is to have a walkthrough from the requirements, design to implementing and testing. An emphasis is put on proper documentation. Extensive hardware expertise is not necessary, so proportionate attention can be given to the design methodology.
3. Despite its apparent simplicity, the problem allows plenty of alternative solutions and should be a motivating and educating exercise. Demonstration of a properly functioning system and sufficient documentation is proof of a completed assignment.
4. Term projects are projects that a group student or might take through from initial specification to implementation. The project deliverables include

Projects
1. Documentation including
   a. A problem statement
   b. A requirements document
5. A design document
7. Manuals/guides for
   a. Users and associated help frames
   b. Programmers
   c. Administrators (installation instructions)
8. A project plan and schedule setting out milestones, resource usage and estimated costs.
9. A quality plan setting out quality assurance procedures
10. An implementation.

REFERENCE BOOKS:
1. Project-based software engineering: An Object-oriented approach, Evelyn Stiller, Cathie LeBlanc, Pearson Education
3. UML2 Toolkit, Hans -Erik Eriksson, etc; Wiley.
### SEMINAR

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The viva-voce for the seminar shall be held with the faculty member, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 40, 20 and 40 percent by the members respectively.
DEPARTMENT OF INFORMATION TECHNOLOGY
M.TECH (INFORMATION TECHNOLOGY)
Scheme of Instruction and Examination
(Regulation:R16)
(with effect from 2016-2017 admitted batch onwards)

III SEMESTER

<table>
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<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Scheme of Examination</th>
<th>Exam Marks</th>
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<td>Thesis Work - Preliminary</td>
<td>10</td>
<td>Review</td>
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</table>

1. Candidates can do their thesis 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.

2. The Thesis Work - Preliminary 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, External Examiner, PG coordinator and guide. The marks shall be awarded in the ratio of 20, 40, 20 and 20 percent by the members respectively.
IV SEMESTER

<table>
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<tr>
<th>Course Code</th>
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1. 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.
2. The Thesis should be submitted at the end of 4th semester and it will be evaluated through Viva–Voce examination by a committee consisting of Head of the Department, External Examiner, PG coordinator and thesis guide. The marks shall be awarded in the ratio of 20, 40, 20 and 20 percent by the members respectively.
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH (CAD/CAM)

Scheme of Instruction and Examination
(Regulation: R16)

(with effect from 2016-2017 admitted batch onwards)

I – SEMESTER

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<td>M16 CAD 1107 Tool Design</td>
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<td>#2-Elective-II</td>
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<td>M16 CAD 1109 Product Design</td>
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<td>M16 CAD 1110 Advanced Numerical Methods</td>
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COMPUTER GRAPHICS

Theory : 4 Periods
Exam : 3 Hrs.

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, focusing on geometric transformations, geometric algorithms, 3D object models (surface, volume and implicit), visible surface algorithms, Shading and curve generation.
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, geometrical transformations and visibility detection.
3. Design and implement an application which illustrates the use of output primitives and 3D viewing model.
4. Implement a method for the computer representation of objects.

SYLLABUS

Geometry and line generation: Line segments, Pixels and frame buffers, Bresenham's algorithms: line, circle, ellipse generation.


Polygons: Polygons representation, An inside test, Filling polygons, Filling with a pattern. Transformations: Scaling transformations, Reflection and zooming, Rotation, Homogeneous coordinates and translation, Rotation about an arbitrary point.

Segments: The segment table, Segment creation, Closing a segment, Deleting a segment. Windowing and clipping: The viewing transformation, Clipping, The clipping of polygons, Generalized clipping.

Three dimensions: 3D geometry, 3D primitives, 3D transformations, Parallel projection, Perspective projection, Isometric projections, Viewing parameters, Special projections.

**Light, color and shading:** Point-source illumination, Shading algorithms, Shadows, Color models.

**Curves and fractals:** Curve generation, Interpolation, B splines, Curved surface patches, Bezier curves, Fractals, Fractal lines, Fractal surfaces.

**TEXT BOOK:**

**REFERENCE BOOKS:**
INTEGRATED COMPUTER AIDED DESIGN

Theory : 4 Periods  Sessionals : 30
Exam : 3 Hrs.  Ext. Marks: 70
Credits : 4

COURSE OBJECTIVES:
1. To understand the basic parametric fundamentals that is used to create and manipulate geometric models.
2. To learn about the concepts of Geometric modelling and to acquire knowledge for generating high quality images.
3. To learn about different tolerance methods, mass property calculations and animation techniques used in designing.

COURSE OUTCOMES:
At the end of the course, the student shall be able to:
1. Understand geometric transformation techniques in CAD.
2. Develop mathematical models to represent lines, curves and surfaces used for engineering applications.
4. Design and analysis of engineering components.

SYLLABUS

Fundamentals of CAD: Introduction, Design process, Application of computer for design, creating the manufacturing database, Benefits of CAD, Design work station, CAD hardware.

Geometric modeling: Geometric modeling techniques - Multiple view 2D input, Wire frame geometry, Surface models, Geometric entities - Curves and Surfaces, Solid modelers, Feature recognition.

Computer aided drafting: AutoCAD tools, 3D model building using solid primitives and boolean operations, 3D model building using extrusion, Editing tools, Multiple views: Orthogonal, Isometric.

Visual realism: Shading solids, Coloring, Color models, Using interface for shading and coloring.

Graphic aids: Geometric modifiers, Naming scheme, Layers, Grids, Groups, Dragging and rubber banding.

Computer animation: Conventional animation, Computer animation - Entertainment animation, Engineering animation, Animation types, Animation techniques.

Mechanical assembly: Assembly modeling, Part modeling, Mating conditions, Generation of assembling sequences, Precedence diagram, Liaison-sequence analysis.
**Mechanical tolerancing:** Tolerance concepts, Geometric tolerancing, Types of geometric tolerances, Location tolerances, Drafting practices in dimensioning and tolerancing, Tolerance analysis.

**Mass property calculations:** Geometrical property formulation - Curve length, Cross-sectional area, Surface area, Mass property formulation - Mass, Centroid, Moments of inertia, Property mapping. Properties of composite objects.

**TEXT BOOK:**
1. CAD/CAM Theory and Practice by Ibrahim Zeid.

**REFERENCE BOOKS:**
COMPUTER NUMERICAL CONTROL TECHNOLOGY

Theory: 4 Periods  
Exam: 3 Hrs.  
Sessionals: 30  
Ext. Marks: 70  
Credits: 4

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, encoders and feedback devices.
4. Identify and select proper NC tooling’s.

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

SYLLABUS

Introduction: NC, DNC, CNC, Programmed Automations, Machine control unit, Part program, NC tooling.

NC machine tools: Nomenclature of NC machine axes, Types of NC machine tools, Machining centres, Automatic tool changes (ATC), Turning centres.

Machine control unit & tooling: Functions of MCU, NC actuation systems, Part program to command signal, MCU organization, Computerized numerical control, Transducers for NC machine tools, Tooling for NC machining centres and NC turning machines, Tool presetting.


Computer aided part programming: NC languages: APT, NELAPT, EXAPT, GNC, VNC, Pre-processor, Post processor.

TEXT BOOK:

REFERENCE BOOKS:
ROBOTICS

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks: 70
Credits : 4

COURSE OBJECTIVES:

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

Introduction: Basic concepts-Robot anatomy-robot configurations-Basic Robot motions-Types of drives-Applications-Material Handling-Processing-Assembly and Inspection -Safety considerations


Robot Programming Methods: Languages-Computer control and Robot Software-VAL system and Language.


TEXT BOOK:
REFERENCE BOOKS:

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 in problems of Engineering and Technology.

COURSE OUTCOMES:
1. Have a basic understanding of conventional and unconventional optimization algorithms.
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
Introduction: Statement of an optimization problem, Engineering Applications, Classification of optimization problems


Stochastic programming (S.P): Basics concepts of probability theory, stochastic linear programming

Unconventional optimization techniques: Multi-objective optimization - Lexicographic method, Goal programming method, Genetic algorithms, A.N.N, Simulated Annealing

TEXT BOOK:
REFERENCE BOOKS:
NEURAL NETWORKS AND FUZZY TECHNIQUES

Theory : 4 Periods  
Exam : 3 Hrs. 

Sessionals : 30  
Ext. Marks: 70  
Credits : 4

COURSE OBJECTIVES:
1. To conceptualize the working of human brain using Artificial Neural Network.
2. To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems.
3. To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.

COURSE OUTCOMES:
Students will be able to
1. Analyze and appreciate the applications which can use Neural Network and fuzzy logic.
2. Identify and describe NNFL techniques and their roles in building intelligent machines.
3. Design inference systems for decision making in manufacturing industries.
4. Realize the difference between learning and programming and explore practical applications of Neural networks (NN).
5. Demonstrate the use of Neuro-fuzzy network for various industry applications.

SYLLABUS


Neural dynamics-I: Activations and signals, Neurons as functions, Signal monotonicity, Biological activations and signals, Neuron fields, Neuronal dynamical systems, Common signal functions, Pulse-coded signal functions.


**Fuzzy associative memories:** Fuzzy systems as between-cube mappings, Fuzzy and neural function estimators, Fuzzy Hebb FAMs, Adaptive FAMs: Product-space clustering in FAM cells. Applications in design and structural analysis.

**TEXT BOOK:**

1. Neural Networks & Fuzzy Systems by Bark Kosko, PHI Published in 1994.

**REFERENCE BOOKS:**

3. Fundamentals of Artificial Neural Networks by Mohamad H Hassoum. PHI.
4. Fuzzy Set Theory & its Application by J. Zimmerman Allied Published Ltd.
5. Algorithms and Applications of Neural Networks in Mechanical Engineering by M. AnandaRao and J. Srinivas, Narosa Publishing House
Course Code: M16 CAD 1107

TOOL DESIGN

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks: 70
Credits : 4

COURSE OBJECTIVES:

1. To impart knowledge on tool engineering, mechanics of metal cutting and importance of tool design in manufacturing.
2. To become familiarize with Design of Jigs and Fixtures, press tool dies and CNC machine tools.

COURSE OUTCOMES:

After completion of the course student will be able to,

1. Classify different types of tools used for different manufacturing processes.
2. Design of Jigs and Fixtures, Press tool dies and tool design for CNC machines.
3. Design different machine tools considering static and dynamic loads.

SYLLABUS

Introduction to tool design

Design of cutting tools
Mechanics of Metal cutting – Oblique and orthogonal cutting - Chip formation and shear angle - Single-point cutting tools – Milling cutters – Hole making cutting tools - Broaching Tools - Design of Form relieved and profile relieved cutters - Design of gear and thread milling cutters

Design of jigs and fixtures

Design of press tool dies

TEXT BOOK:

REFERENCE BOOKS:
DESIGN OF HYDRAULIC AND PNEUMATIC SYSTEMS

Theory : 4 Periods
Exam : 3 Hrs.
Sessionals : 30
Ext. Marks: 70
Credits : 4

COURSE OBJECTIVES:

1. To introduce the industrial hydraulics and pneumatics, their parts, functions and their structure.
2. To give the required information about hydraulics and pneumatics and to teach the fundamentals of hydraulic and pneumatic circuit design.
3. To teach the hydraulic and pneumatic automation and basics of PLC controls.

COURSE OUTCOMES:

The students who attend to this course
1. Can explain the similarities and differences of the electrical, pneumatic and hydraulic systems
2. Can decide which system is better for a specific application.
3. Can explain the basic parts of the industrial hydraulic and pneumatic systems and their functions.
4. Can design a hydraulic or pneumatic system circuit by using related software and make simulations
5. Can design a hydraulic or pneumatic system and outline PLC control algorithm for a predefined automation process

SYLLABUS

Oil hydraulic systems and hydraulic actuators specification of pumps, pump characteristics. specification and characteristics. Hydraulic Power Generators – Selection and Linear and Rotary Actuators – selection

Control and regulation elements Pressure - direction and flow control valves - relief valves, non-return and safety valves - actuation systems.


Pneumatic systems and circuits Pneumatic fundamentals - control elements, position and pressure sensing - logic circuits - switching circuits - fringe conditions modules and these integration - sequential circuits - cascade methods - mapping methods - step counter method - compound circuit design - combination circuit design.

Installation, maintenance and special circuits Pneumatic equipments- selection of components - design calculations – application -fault finding - hydro pneumatic circuits - use of microprocessors for sequencing - PLC, Low cost automation - Robotic circuits.
TEXT BOOK:

REFERENCE BOOKS:
COURSE OBJECTIVES:

1. To impart the process of product design.
2. To expose the various factors influencing product design.

COURSE OUTCOMES:

Students will be able to

1. Apply various tools of problem solving to arrive at a fruitful design.
2. Analyse the factors influencing the design.
3. Determine the risk and reliability aspects associated with product design.
4. Select appropriate manufacturing processes to realize the product design.

SYLLABUS

Design philosophy: Design process, Problem formation, Introduction to product design, various design models-Shigley model, Asimov model and Norton model, Need analysis, Strength considerations -standardization. Creativity, Creative techniques, Material selections, Notches and stress concentration, design for safety and Reliability

Failure theories: Static failure theories, Distortion energy theory, Maximum shear stress theory, Coulomb-Mohr’s theory, Modified Mohr’s theory, Fracture mechanics theory. Fatigue failure theories, Fatigue mechanisms, Fatigue failure models, Fatigue failure criteria, Methods to reduce fatigue, Design for fatigue, Modified Goodman Diagram, Gerber method, Soderberg line, Surface failure models. Lubrication, friction and wear

Product Design: Product strategies, Product value, Product planning, product specifications, concept generation, concept selection, concept testing.

Design for manufacturing: Forging design, Casting design, Design process for non metallic parts, Plastics, Rubber, Ceramic, Wood, Glass parts.


TEXT BOOK:

REFERENCE BOOKS:
ADVANCED NUMERICAL METHODS

Theory : 4 Periods
Exam : 3 Hrs.

Sessionals : 30
Ext. Marks: 70
Credits : 4

COURSE OBJECTIVES:

1. To know how to solve system of equations, ordinary differential equations and partial
differential equations numerically
2. To impart the knowledge on finite difference and finite element methods used for
approximation.

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 a approximation solution for engineering problems using finite difference and finite
element methods.

SYLLABUS

Algebraic equations: Systems of linear equations: Gauss Elimination method, pivoting
techniques, Thomas algorithm for tridiagonal system – Jacobi, Gauss Seidel, SOR iteration
methods - Systems of nonlinear equations: Fixed point iterations, Newton Method, Eigenvalue
problems: power method, inverse power method, Faddeev – Leverrier Method.

Ordinary differential equations: RungeKutta Methods for system of IVPs, numerical stability,
Adams-Bashforth multistep method, solution of stiff ODEs, shooting method, BVP: Finite
difference method, orthogonal collocation method, orthogonal collocation with finite element
method, Galerkin finite element method.

Finite difference method for time dependent partial differential equation parabolic
equations: explicit and implicit finite difference methods, weighted average approximation -
Dirichlet and Neumann conditions – Two dimensional parabolic equations – ADI method; First
order hyperbolic equations – method of characteristics, different explicit and implicit methods;
numerical stability analysis, method of lines – Wave equation: Explicit scheme- Stability of
above schemes.

Finite difference methods for elliptic equations laplace and poisson’s equations in a
rectangular region: Five point finite difference schemes, Leibmann’s iterative methods,
Dirichlet and Neumann conditions – Laplace equation in polar coordinates: finite difference
schemes – approximation of derivatives near a curved boundary while using a square mesh.

Finite element method partial differential equations – Finite element method - orthogonal
collocation method, orthogonal collocation with finite element method, Galerkin finite element
method.
TEXT BOOK:

REFERENCE BOOKS:
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.
The viva-voce for the seminar shall be held with the faculty member, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 40, 20 and 40 percent by the members respectively.
## DEPARTMENT OF MECHANICAL ENGINEERING
### M.TECH (CAD/CAM)

**Scheme of Instruction and Examination**
*(Regulation:R16)*

(with effect from 2016-2017 admitted batch onwards)

**II – SEMESTER**

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Lab hours</th>
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<td>Computer Integrated Manufacturing</td>
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<td>Flexible Manufacturing Systems</td>
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<td>M16 CAD 1206 Intelligent Manufacturing Systems</td>
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<td>M16 CAD 1207 Concurrent Engineering</td>
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<td>#4-Elective-IV</td>
<td>M16 CAD 1208 Signal Analysis &amp; Condition Monitoring</td>
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<td>M16 CAD 1210 Metrology and Non Destructive Testing</td>
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COMPUTER INTEGRATED MANUFACTURING

COURSE OBJECTIVES:

1. To impart the students the basic knowledge of automated production process.
2. To provide the knowledge of automated assembly operations.
3. To provide the knowledge of automated inspection, material handling operations.
4. To provide the knowledge of flexible manufacturing.

COURSE OUTCOMES:

At the end of the course, the student shall be able to:
1. Understand the effect of manufacturing automation strategies and derive production metrics.
2. Analyze automated flow lines and assembly systems, and balance the line.
3. Design automated material handling and storage systems for a typical production system.
4. Design a manufacturing cell and cellular manufacturing system.
5. Develop CAPP systems for rotational and prismatic parts.

SYLLABUS

Introduction: Scope of computer integrated manufacturing, Product cycle, Production automation.

Group technology: Role of group technology in CAD/CAM integration, Methods for developing part families, Classification and coding, Examples of coding systems, Facility design using group technology, Economics of group technology.


Integrative manufacturing planning and control: Role of integrative manufacturing in CAD/CAM integration, Over view of production control - Forecasting, Master production schedule, Capacity planning, M.R.P., Order release, Shop-floor control, Quality assurance, Planning and control systems, Cellular manufacturing, JIT manufacturing philosophy.

Computer aided quality control: Terminology in quality control, Contact inspection methods, Noncontact inspection methods, Computer aided testing, Integration of CAQC with CAD/CAM.

Computer integrated manufacturing systems: Types of manufacturing systems, Machine tools and related equipment, Material handling systems, Computer control systems, FMS.
TEXT BOOK:

REFERENCE BOOKS:
MECHATRONICS

Theory : 4 Periods
Sessionals : 30
Exam : 3 Hrs.
Ext. Marks: 70
Credits : 4

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 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

Mechatronics system design: Introduction to Mechatronics: What is mechatronics, Integrated design issues in mechatronics, Mechatronics key elements, the mechatronics design process, Advanced approaches in mechatronics.

Modelling and simulation of physical systems: Simulation and block diagrams, Analogies and impedance diagrams, Electrical systems, Mechanical translational systems, Mechanical rotational systems, Electromechanical coupling, Fluid systems.


Signals, systems and controls: Introduction to signals, systems and controls, System representation, Linearization of nonlinear systems, Time delays.

Real time interfacing: Introduction, Elements of a data acquisition and control system, Overview of the I/O process, Installation of the I/O card and software.

Advanced applications in mechatronics: Sensors for condition monitoring, Mechatronic control in automated manufacturing, Artificial intelligence in mechatronics, Microsensors in mechatronics.
TEXT BOOK:

REFERENCE BOOKS:
FLEXIBLE MANUFACTURING SYSTEMS

COURSE OBJECTIVES:

1. To impart the knowledge of flexible manufacturing.
2. To impart the knowledge of high level distributed data processing methods of various industrial processes like assembly operations, material handling, buffer storage, tool and fixtures and storage system.
3. To impart the knowledge of Computer Integrated data base and computer integrated manufacturing.

COURSE OUTCOMES:

At the end of the course, the student shall be able to:
1. Classify and distinguish FMS and other manufacturing systems including job-shop and mass production systems.
2. Explain processing stations and material handling systems used in FMS environments.
3. Design and analyze FMS using simulation and analytical techniques.
4. Understand tool management in FMS.
5. Analyze the production management problems in planning, loading, scheduling, routing and breakdown in a typical FMS.

SYLLABUS

Introduction: The economic justification of FMS, The basic components of FMS and their integration in the data processing system, The concept of the 'total system'.

Management decisions during FMS project planning, design and implementation: Designing the FMS, Data processing design, FMS project and software documentation.

Artificial intelligence in the design of FMS: LISP, PROLOG, Expert systems, Expert systems in FMS design and control, Integrative aspects of AI languages.

Distributed processing in FMS: Introduction to database management systems (DBMS) and their application in CAD/CAM and FMS, Distributed systems in FMS.

Distributed tool data bases in FMS: The distributed tool data structure with a general purpose tool description facility, Implementation of the FMS tool data base, Application possibilities of the FMS tool data base.
**FMS database for clamping devices and fixtures:** The FMS clamping device and fixture database, The analysis and calculation of pallet alignment and work mounting errors, Mating surface description methods for automated design and robotised assembly, Application of industrial robots in FMS, The application of automated guided vehicle (AGV) systems.

**Coordinate measuring machines in computer integrated systems:** Overview of coordinate measuring machine, Contact and non-contact inspection principles, Part programming coordinate measuring machines, In-cycle gauging.

**TEXT BOOK:**

**REFERENCE BOOKS:**
COURSE Objectives:

1. To teach students the basic principles and basic implementation method of finite element methods.
2. To teach students how to perform structural and Thermal analysis using finite element methods.

COURSE Outcomes:

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

1. Understand the principles and concepts related to finite element methods.
2. Implement finite element methods for simple analysis of 1-D problems such as bar, truss, beam and 1-D heat conduction either by hand calculation or by programming.
3. Numerically solve for deformation, stresses and strains of a structural component subjected to axial, torsion, and bending loads.
4. Understand the basic knowledge about finite element methods for solving time-dependent and/or non-linear problems.
5. Use commercial software package to perform structural and thermal analysis and are able to conduct engineering design.

SYLLABUS

Introduction to FEM, basic concepts, historical background, applications of FEM, general description, comparison of FEM with other methods, variational approach, Glerkin’s Methods. Coordinates, basic element shapes, interpolation function, Virtual energy principle, Rayleigh – Ritz method, properties of stiffness matrix, treatment of boundary conditions, solution of system of equations, shape functions and characteristics, Basic equations of elasticity, strain-displacement relations.


TEXT BOOK:
1. Introduction to Finite Elements in Engineering, Chandrupatla, Ashok and Belegundu, Prentice – Hall.

REFERENCE BOOKS:
3. Concepts and Applications of Finite Element Analysis by Cook, R.D.
4. Applied Finite Element Analysis by Segerland, L.J.
VISION SYSTEMS AND IMAGE PROCESSING

COURSE OBJECTIVES:

1. To acquire the fundamental concepts of a digital image processing system
2. To design and implement algorithms that perform basic image processing
3. To Develop Fourier transform for image processing in frequency domain
4. To Provide mathematical foundations for digital manipulation of images; image acquisition; pre-processing; segmentation; Fourier domain processing; and compression
5. To Learn and understand the Image Enhancement in the Spatial Domain
6. To Learn and understand the Image Enhancement in the Frequency Domain.
7. To Understand the Image Restoration, Compression, Segmentation, Recognition, Representation and Description.

COURSE OUTCOMES:

Upon completion of this course, students will be familiar with

1. Basic image processing techniques for solving real problems
2. Analyze general terminology of digital image processing
3. Understand fundamental concepts and theory of Discrete Fourier Series and Discrete Fourier Transform
4. Examine various types of images, intensity transformations and spatial filtering.
5. Have a good understanding of the mathematical foundations for digital manipulation of images; image acquisition; pre-processing; segmentation; Fourier domain processing, compression and analysis.

SYLLABUS


Spatial domain techniques - Convolution, Correlation. Frequency domain operations - Fast Fourier transforms, FFT, DFT, Investigation of spectra. Hough transform

Image enhancement, Filtering, Restoration, Histogram equalisation, Segmentation, Region growing.

Image compression - Edge detection - Thresholding - Spatial smoothing - Boundary and Region representation - Shape features - Scene matching and detection - Image classification.
TEXT BOOK:

REFERENCE BOOKS:
1. Robot Vision by Prof. Alan Pugh (Editor), IFS Ltd., U.K.
COURSE OBJECTIVE:

1. To teach the student the principles and practices of intelligent product design and manufacturing

COURSE OUTCOME:

1. At the end of this course the student will be able to apply Internet technology in manufacturing Industry and use techniques of Knowledge Representation

SYLLABUS


Components of Knowledge Based Systems - Basic Components of Knowledge Based Systems, Knowledge Representation, Comparison of Knowledge Representation Schemes, Interference Engine, Knowledge Acquisition.

Machine Learning - Concept of Artificial Intelligence, Conceptual Learning, Artificial Neural Networks - Biological Neuron, Artificial Neuron, Types of Neural Networks, Applications in Manufacturing.


TEXT BOOK:
1. Intelligent Manufacturing Systems/ Andrew Kusiak/Prentice Hall.

REFERENCE BOOKS:
3. Neural networks: A comprehensive foundation/ Simon Hhaykin/ PHI.
4. Artificial neural networks/ B.Vegnanarayana/PHI.
5. Neural networks in Computer intelligence/ Li Min Fu/ TMH/2003’
CONCURRENT ENGINEERING

Theory : 4 Periods
Exam : 3 Hrs.

Sessionals : 30
Ext. Marks: 70
Credits : 4

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 be 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

Introduction: Concurrent design of products and systems - Product design - Fabrication and assembly system design - designing production systems for robustness and structure.

Strategic approach and technical aspects of product design: Steps in the strategic approach to product design - Comparison to other product design methods - Assembly sequence generation - Choosing a good assembly sequence - Tolerances and their relation to assembly - Design for material handling and part mating - Creation and evaluation of testing strategies.

Basic issues in manufacturing system design: System design procedure - Design factors - Intangibles - Assembly resource alternatives - Task assignment - Tools and tool changing - Part feeding alternatives - Material handling alternatives - Floor layout and system architecture alternatives.

Assembly workstation design: Strategic issues - Technical issues analysis.
Design of automated fabrication systems: Objectives of modern fabrication system design - System design methodology - Preliminary system feasibility study - Perform detailed work content analysis - Define alternative fabrication configurations - Configuration design and layout - Human resource considerations - Evaluate technical performance of solution.

Case studies: Automobile air conditioning module - Robot assembly of automobile rear axles.

TEXT BOOK:


REFERENCE BOOK:

COURSE OBJECTIVES:

1. To acquire basic knowledge on signal analysis of stationary, continuous non-stationary signals and transient signals.
2. To understand the maintenance scheme, their scope and limitations.
3. To apply the maintenance strategies to various problems in the industrial sectors.

COURSE OUTCOMES:

Students will be able to

1. Understand the concepts of Fourier analysis and practical analysis of various signals.
2. Develop an appreciation for the need of modern technological approach for plant maintenance to reduce the maintenance expenditure.
3. Analyze for machinery condition monitoring and explain how this compliments monitoring the condition.

SYLLABUS

**Introduction**: Basic concepts, Fourier analysis. Bandwidth, Signal types, Convolution.

**Signal analysis**: Filter response time, Detectors, Recorders, Analog analyzer types.

**Practical analysis of stationary signals**: Stepped filter analysis, Swept filter analysis, High speed analysis, Real-time analysis.

**Practical analysis of continuous non-stationary signals**: Choice of window type, Choice of window length, Choice of incremental step, Practical details, Scaling of the results.

**Practical analysis of transients**: Analysis as a periodic signal, Analysis by repeated playback (constant bandwidth). Analysis by repeated playback (variable bandwidth).

**Condition monitoring in real systems**: Diagnostic tools, Condition monitoring of two stage compressor, Cement mill foundation, I.D. fan. Sugar centrifugal, Cooling tower fan, Air separator, Preheater fan, Field balancing of rotors, ISO standards on vibrations.

**TEXT BOOKS**:

1. Frequency Analysis by R.B. Randall.
2. Condition Monitoring of Mechanical Systems by Kolacat.

**REFERENCE BOOK**:

ADDITIVE MANUFACTURING

Theory: 4 Periods
Exam: 3 Hrs.
Sessionals: 30
Ext. Marks: 70
Credits: 4

COURSE OBJECTIVES:

1. To introduce Rapid Prototype tools and techniques and additive manufacturing techniques for design and Manufacturing.

COURSE OUTCOMES:

Students will be able to
1. Assess the need of RPT in Product development.
2. Judge the correct RP Process for Product/Prototype development.
3. Predict the technical challenges in 3D printing.
4. List the applications of RPT

SYLLABUS


Other additive manufacturing systems: Three dimensional Printing (3DP): Principle, basic process, Physics of 3DP, types of printing, process capabilities, material system. Solid based, Liquid based and powder based 3DP systems, strength and weakness, Applications and case studies. Shape Deposition Manufacturing (SDM), Ballastic Particle Manufacturing (BPM), Selective Laser Melting, Electron Beam Melting.

TEXT BOOK:

REFERENCE BOOKS:
METROLOGY AND NON DESTRUCTIVE TESTING

Theory : 4 Periods  Sessionals : 30
Exam : 3 Hrs.  Ext. Marks: 70
Credits : 4

COURSE OBJECTIVES:

1. To learn about various precision measuring instruments and their applications.
2. To learn about various statistical quality control tools and techniques to improve the quality of the product.
3. To provide understanding on basic NDT techniques and their importance.

COURSE OUTCOMES:

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

1. Know how to use different measuring instruments.
2. Understand the philosophy and basic concepts of quality improvement.
3. Determine basic process capability, evaluate measurement error, and evaluate simple acceptance sampling plans.
4. Select and carry out appropriate NDT techniques in accordance with established procedures.

SYLLABUS


Statistical Quality Control - Data presentation - Statistical measures and tools - Process capability - Confidence and tolerance limits - Control charts for variables and for fraction defectives - Theory of probability - Sampling - ABC standard - Reliability and life testing.

Liquid penetrant and magnetic particle tests - Characteristics of liquid Penetrants - different washable systems - Developers - applications - Methods of production of magnetic fields - Principles of operation of magnetic particle test - Applications - Advantages and limitations.

Radio Graphy - Sources of ray-x-ray production - properties of d and x rays - film characteristics - exposure charts - contrasts - operational characteristics of x ray equipment - applications.

Ultrasonic and acoustic emission techniques - Production of ultrasonic waves - different types of waves - general characteristics of waves - pulse echo method - A, B, C scans - Principles of acoustic emission techniques - Advantages and limitations - Instrumentation - applications.

TEXT BOOKS:

REFERENCE BOOKS:

CAM LAB

Lab : 3 Periods 
Exam : 3 Hrs. 
Sessionals : 50
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:

The viva-voce for the seminar shall be held with the faculty member, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 40, 20 and 40 percent by the members respectively.
1. Candidates can do their thesis 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.

2. The Thesis Work -Preliminary 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, External Examiner, PG coordinator and guide. The marks shall be awarded in the ratio of 20, 40, 20 and 20 percent by the members respectively.
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH (CAD/CAM)

Scheme of Instruction and Examination
(Regulation:R16)

(with effect from 2016-2017 admitted batch onwards)

IV – SEMESTER

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Scheme of Examination</th>
<th>Exam Marks</th>
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<td>Thesis Work - Final</td>
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<td>Viva-voce</td>
<td>100</td>
<td>100</td>
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1. 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.

2. The Thesis should be submitted at the end of 4th semester and it will be evaluated through Viva–Voce examination by a committee consisting of Head of the Department, External Examiner, PG coordinator and thesis guide. The marks shall be awarded in the ratio of 20, 40, 20 and 20 percent by the members respectively.