Highlighted Employability Courses (M.Tech) for the Academic Year - 2016-2017

INDEX

CIVIL ENGINEERING

SYLLABUS: THEORY OF ELASTICITY (M16 ST 1101)

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 Vanants 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.

Three Dimensional State of Stress:

Differential equations of equilibrium – Boundary conditions for compatibility – Displacements – Equations of equilibrium in terms of displacements – Principle of superposition – Uniqueness of solution.

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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 ST 1101	
Course Title: THEORY OF ELASTICITY	
CO-1	Analyze the stresses and strains for two dimensional and three-dimensional elements.
CO-2	Understand the equilibrium and compatibility conditions.
CO-3	Solve the problems on Torsion for different shaped bars.

SYLLABUS: ADVANCED REINFORCED CONCRETE DESIGN (M16 ST 1102)

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.

Estimation of Crack width in Reinforced Concrete Members: Introduction, Factors affecting crack width in beams, Mechanisms of flexural cracking, Calculation of crack width, Simple empirical method, Estimation of crack width in beams by IS 456, Shrinkage and thermal cracking.

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 - □), Relation of reinforced concrete sections.

Approximation Analysis of Grid Floors: Introduction, Analysis of flat grid floors, Analysis of rectangular grid floors by Timoshenko plate theory. Analysis of grid by stiffness matrix method, Analysis of grid floors by equating joint deflections, Comparison of methods of analysis, Detailing of steel in flat grids.

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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 ST 1102	
Course Title: ADVANCED REINFORCED CONCRETE DESIGN	
CO-1	Estimate the crack width and deflection with regard to the serviceability.
CO-2	Analyze and design a grid floor system.
CO-3	Analyze and design a flat slab system.
CO-4	Analyze and design bunkers, silos and chimneys.
CO-5	Analyze and design of concrete structures against fire resistance, according to ISO 834standards.

SYLLABUS: MATRIX METHODS OF STRUCTURAL ANALYSIS (M16 ST 1103)

Introduction to Matrix methods: Introduction, coordinate systems, displacement and force transformation matrices, element and structure stiffness matrices, Element and structure flexibility matrices, equivalent joint loads, stiffness and flexibility approaches.

Matrix methods for beams: Analysis of beams, fixed and continuous beams by flexibility method. Analysis of beams, fixed and continuous beams by stiffness method.

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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 ST 1103	
Course Title: MATRIX METHODS OF STRUCTURAL ANALYSIS	
CO-1	Analyze various beams by the matrix methods at different loading conditions.
CO-2	Analyze various Plane truss problems by the matrix methods.
CO-3	Analyze Plane Frames by the matrix methods at different loading conditions.

SYLLABUS: STRUCTURAL DYNAMICS (M16 ST 1104)

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 equation, Model analysis of multi degree systems, Multistory 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), and 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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 ST 1104	
Course Title: STRUCTURAL DYNAMICS	
CO-1	Solve the problems on Single degree of freedom.
CO-2	Understand the difference between harmonic loading and impulse loading and the related analysis procedures.
CO-3	Evaluate the structural properties, mode shapes for different structures.

SYLLABUS: ADVANCED FOUNDATION ENGINEERING (M16 ST 1105)

Foundations, Types of shear failures in foundation soils, Types of foundations, Introduction: Principles of Design of Design Loads, Basic Concepts of safe and allowable bearing capacity. Shallow 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.

Proportioning of footings: Isolated column footings, Strip, combined Footings and Strap Footing. Raft Foundations: Bearing capacity of raft foundation, floating raft, Types of rafts, Beam on Elastic foundation and Conventional methods of Design, determination of modulus of subgrade reaction.

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 - Brooms 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 Terzaghis Method, Design aspects of Components of well foundation.

Foundations in Expansive Solis: Introduction, Identification of expansive soils, Swell potential and swelling pressure, Active depth, Foundation Problems, Foundation practices in expansive soils, Soil Replacement and „CNS" concepts.

Foundations of Transmission Line Towers: Introduction, Necessary information, Forces on tower foundations, General design criteria, Choice and type of foundation, Design procedure.

Course Outcomes for First Year First Semester Course	
Course Code: M16 ST 1105	
Course Title: ADVANCED FOUNDATION ENGINEERING	
CO-1	The design of shallow and deep foundations to carry ultimate loads.
CO-2	Interpretation and selection of appropriate soil parameters from site investigation data.
CO-3	Field monitoring in geotechnical design.
CO-4	Select the most appropriate foundation solution for a given situation; derive appropriate soil parameters.
CO-5	Distinguish between different foundation types and their appropriate use.
CO-6	Synthesize foundation performance measurements from a range of test data reported in the literature.

SYLLABUS: WIND ANALYSIS AND DESIGN OF TALL STRUCTURES (M16 ST 1106)

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.

Lateral load Analysis of Multistory Building Frames: Analysis of Multistory Building Framesfor lateral loads, Cantilever method, Portal method and Factor method.

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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 ST 1106	
Course Title: WIND ANALYSIS AND DESIGN OF TALL STRUCTURES	
CO-1	Know the types of tall buildings.
CO-2	Analyze the plane frame systems by different methods.
CO-3	Design the shear wall system and in filled frame systems.
CO-4	Design the RC chimney and Bunkers and Silos.

SYLLABUS: EXPERIMENTAL STRESS ANALYSIS (M16 ST 1107)

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.

Photo elasticity: Two dimensional photo elasticity, Concept of light – photo elastic 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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 ST 1107	
Course Title: EXPERIMENTAL STRESS ANALYSIS	
CO-1	Know the working principle of strain gauges.
CO-2	Do the model analysis using different theorems.
CO-3	Know the concepts of photo elasticity and its applications.
CO-4	Analysis of Stress, strain, Stress- Strain relation and theories of failure

SYLLABUS: ADVANCED CONCRETE TECHNOLOGY (M16ST 1108)

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 concretes: Lightweight concrete, autoclaved aerated concrete, no-fines concrete, lightweight aggregate concrete and foamed concrete, High strength concrete, refractory concrete, high density and radiation-shielding concrete, polymer concrete, fibre-reinforced concrete, mortars, renders, recycled concrete, Ferro Cement, Self-Compacting 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

Course Outcomes for First Year First Semester Course	
Course Code: M16 ST 1108	
Course Title: ADVANCED CONCRETE TECHNOLOGY	
CO-1	Know the various materials in concrete and admixtures.
CO-2	Do the Mix design by different methods.
CO-3	Get a thorough knowledge of various types of cement, aggregates and properties of Special concrete.
CO-4	Know the different procedures for testing concrete

SYLLABUS: BRIDGE ENGINEERING (M16 ST 1109)

Introduction to bridge engineering. Historical background of bridges and types. Bridge aesthetics and proportioning. Design process. Review of applicable design codes. Loads on bridges and force distribution. Bridge geometry.

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, and Elastomeric bearing.

Course Outcomes for First Year First Semester Course	
Course Code: M16 ST 1109	
Course Title: BRIDGE ENGINEERING	
CO-1	Understood the load distribution and IRC standards.
CO-2	Design the slab bridges.
CO-3	Design the Arch bridges
CO-4	Design the bridge bearings, hinges and expansion joints.

SYLLABUS: OPTIMIZATION TECHNIQUES (M16 ST 1110)

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 Uni- modal)

Classical Optimization Techniques: Differential calculus method, Multivariable optimization by method of constrained variation and Lagrange multipliers (generalized problem). Kuhn- Tucker conditions for optimality.

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

Non-linear Programming: Unconstrained minimization – Fibonacci, Golden section, Quadratic and Cubic interpolation methods for a one-dimensional minimization and Univariate Method, Powels method, Newtons method and Davidon Fletcher Powell method for multivariable optimization. Constrained minimization – Cutting plane method, Zoutendijk method and penalty function methods.

Linear programming – Definitions and theorems – Simplex method – Duality in linear programming. Plastic analysis and minimum weight design and rigid frame.

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

Course Outcomes for First Year First Semester Course	
Course Code: M16 ST 1110	
Course Title: OPTIMIZATION TECHNIQUES	
CO-1	Derive optimized structure using classical and modern methods of optimization.
CO-2	Gain the knowledge on Formulation of Structural Optimization problems.
CO-3	Gain the knowledge on the concept of classical methods of optimization for multivariable
CO-4	With equality or inequality constraints: solution by method of Lagrange Multiplier -Applications in structural engineering, Kuhn-Tucker conditions.

SYLLABUS: COMPUTER APPLICATION IN STRUCTURAL ENGINEERING (M16 ST 1111)

(VIVA-VOCE)

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

1. Analysis and Design of Beams.
2. Analysis and Design of Footings.
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.
8. Implementation of Concepts of FEM using a Computer Language.

Course Outcomes for First Year First Semester Course	
Course Code: M16 ST 23	
Course Title: COMPUTER APPLICATIONS IN STRUCTURAL ENGINEERING	
CO-1	Analyze the structural elements using software designs.
CO-2	Design the structures fir the dynamic loads using software's.
CO-3	Solve the finite elements application problems of structural engineering by software's.

SYLLABUS: DESIGN OF STRUCTURES (M16ST1112)

(VIVA-VOCE)

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

Course Outcomes for First Year First Semester Course	
Course Code: M16 ST 24	
Course Title: DESIGN OF STRUCTURES	
CO-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

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Chinna Amiram, Bhimavaram-534204

Estd: 1980

SYLLABUS: THEORY OF PLATES AND SHELLS (M16 ST 1201)

Bending of Long Rectangular Plates to a Cylindrical Surface: Differential equation for cylindrical bending of plates – Uniformly leaded rectangular plates with simple supported edges and with built in edges. Pure bending of plates slopes – Curvatures of bent plates – Relations between bending moments and curvature – Particular cases – Strain energy in pure bending – Limitations.

Symmetrical Bending of Circular Plates: Differential equation – Boundary conditions. Simply supported rectangular plates under sinusoidal loading – Naviers solution and its application to concentrated load – Levys 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.

Bending analysis of cylindrical shell: Beam method, Schorer method, Finsterwalder method.Classification analysis.

Course Outcomes for First Year Second Semester Course	
Course Code: M16ST 1201	
Course Title: Theory of Plates and Shells	
CO-1	Analyze and design for plates for different loadings.
CO-2	Analyze and design of shells.
CO-3	Explain the concept of theory of cylindrical shells.

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Estd: 1980

SYLLABUS: STRUCTURAL STABILITY (M16 ST 1202)

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 behavior.

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, Galerkins 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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 ST 1202	
Course Title: STRUCTURAL STABILITY	
CO-1	Analyze structures with linear and nonlinear behavior.
CO-2	Gain the knowledge on Stability of Continuous systems.
CO-3	Distinguish elastic buckling and in elastic buckling.

SYLLABUS: FINITE ELEMENT METHODS OF ANALYSIS (M16 ST 1203)

Introduction: A brief history of F.E.M. Need of the method, Review of basic principles of solid mechanics- Equations of equilibrium, Boundary conditions, Compatibility, Strain displacement relations, Constitutive relationship in matrix form, plane stress & plane strain and axisymmetric bodies of revolution with axi-symmetric loading, Energy principles - Raleigh - Ritz method of functional approximation.

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.

Isoperimetric representation and its formulation for 2d analysis. Formulation of 4-noded and 8- noded isoperimetric quadrilateral elements – Lagrangian elements-serendipity elements.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 ST 1203	
Course Title: FINITE ELEMENT METHODS OF ANALYSIS	
CO-1	Understand the fundamentals of Finite element method.
CO-2	Derive the solution of the problems of 1D and 2D by FEM.
CO-3	Apply the concept of iso-parametric formulation for solving problems.
CO-4	Derive the shape functions for higher order elements.
CO-5	Determine solution for higher order elements problems by numerical techniques.

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Estd: 1980

SYLLABUS: EARTHQUAKE ENGINEERING (M16 ST 1204)

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.

Earthquakes, Epicenter, Hypocenter and earthquake waves, Measurement of ground motion, Seismic regions, Intensity and Isoseismals of an earthquake, Magnitude and energy of an earthquake, Consequences of earthquakes, Seismic zoning. Earthquake Response of Linear Systems: Earthquake excitation, Equation of motion, Response quantities, Response history, Response spectrum concept, Deformation, Pseudo-velocity, and Pseudo-acceleration, Response spectra, Peak structural response from the response spectrum, Response spectrum characteristics, Elastic design spectrum, Comparison of design and response spectra, Distinction between design and response spectra.

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, Behavior 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 method, Vertical component of reservoir load, Concrete or masonry gravity dams.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 ST 1204	
Course Title: EARTHQUAKE ENGINEERING	
CO-1	Describe various terms of engineering seismology.
CO-2	Design earthquake-resistant structures.
CO-3	Gain the knowledge on seismic codal provisions and detailing.
CO-4	Acquire the knowledge in structural irregularities in seismic planning and shear wall concept.

SYLLABUS: RELIABILITY ANALYSIS AND DESIGN (M16 ST 1205)

(ELECTIVE–III)

Concepts of Structural Safety: General, Design methods.

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

Probability Theory: Introduction, Random events, Random variables, Functions of random variables, Moments and expectation, Common probability distribution, Extremal distribution.

Resistance Distributions and Parameters: Introduction, Statistics of properties of concrete, Statistics of properties of steel, Statistics of strength of bricks and mortar, Dimensional variations, Characterization of variables, Allowable stresses based on specified reliability.

Probabilistic Analysis of Loads: Gravity loads, Wind load.

Basic Structural Reliability: Introduction, Computation of structural reliability. Monte Carlo Study of Structural Safety: General, Monte Carlo method, Applications.

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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 ST 1205	
Course Title: Reliability Analysis and Design	
CO-1	Understand the importance of reliability in Civil engineering.
CO-2	Apply the concepts of computation of structural reliability for solving engineering problems.
CO-3	Gain the knowledge of reliability based structural design.

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Estd: 1980

SYLLABUS: PRESTRESSED CONCRETE (M16 ST 1206)

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.

(4) 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

Transfer of prestress in Pretensioned members: Transmission length, bond stress, Transverse tensile stress, End Zone reinforcement, flexural bond stress, I.S. Code Provisions.

Anchorage zone in post tensioned members: Introduction, stress distribution in End block, Investigation on Anchorage Zone Stresses- Magnels method, Guyons 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

Course Outcomes for First Year Second Semester Course	
Course Code: M16 ST 1206	
Course Title: Pre-stressed Concrete	
CO-1	Analyze and design pre-stressed concrete members.
CO-2	Gain the knowledge on materials, pre-stressing Systems, end anchorages.
CO-3	Gain the knowledge on losses of pre-stress.
CO-4	Analyze and design of sections for flexure.

SYLLABUS: GROUND IMPROVEMENT TECHNIQUES (M16 ST 1207)

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.

Stabilization: Introduction, objectives, Methods of stabilization – Mechanical, Cement, Lime, Bituminous, Calcium chloride; construction methods, factors affecting stabilization of soils; Deep Mixing methods – Soil lime Columns and Cement Lime Columns, applications.

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.

Grouting: Definition, Objectives of grouting, Grouts and their properties, Categories of Grouting, Grouting methods: Ascending, Descending and Stage Grouting in Soils, Hydrofracture, Grouting Equipment, Post grouting tests. In-situ Reinforcement**:** Ground Anchors, Tiebacks and Soil Nailing, Micropiles.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 ST 1207	
Course Title: GROUND IMPROVEMENT TECHNIQUES	
CO-1	Implement the stabilization methods
CO-2	Apply grouting and dewatering techniques
CO-3	Understand the concept of in-situ reinforcement

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Estd: 1980

SYLLABUS: INDUSTRIAL STRUCTURES (M16 ST 1208)

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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 ST 1208	
Course Title: Industrial Structures	
CO-1	Know the requirements of various industries.
CO-2	Get an idea about the materials used and planning.
CO-3	Know the construction techniques.
CO-4	Understood the functional requirements.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

Chinna Amiram, Bhimavaram-534204

Estd: 1980

SYLLABUS: DESIGN OF STEEL BRIDGES (M16 ST 1209)

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

Course Outcomes for First Year Second Semester Course	
Course Code: M16 ST 1209	
Course Title: DESIGN OF STEEL BRIDGES	
CO-1	Apply the IS code of practice for the design of steel bridges.
CO-2	Analyze and design of Plate girder Bridges.
CO-3	Analyze and design of truss girder Bridges.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

Chinna Amiram, Bhimavaram-534204

Estd: 1980

SYLLABUS: INELASTIC DESIGN OF SLABS (M16 ST 1210)

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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 ST 1210	
Course Title: INELASTIC DESIGN OF SLABS	
CO-1	Understand the elastic theory analysis.
CO-2	Understand the yield line theory.
CO-3	Analyze the slabs by principle of virtual work.
CO-4	Analyze the slabs by using equilibrium method.
CO-5	Design the slabs for different edge conditions.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

Chinna Amiram, Bhimavaram-534204

Estd: 1980

SYLLABUS: REPAIR AND REHABILITATION OF STRUCTURES (M16 ST 1211)

(VIVA-VOCE)

Materials: Construction chemicals, Mineral admixtures, Composites, Fibre reinforced concrete, High performance concrete, Polymer-impregnated concrete.

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.

Foundation Problems: Settlement of soils – Repairs, Sinking of piles – Repairs.

Corrosion of Reinforcement: Preventive measures – Coatings – Use of SBR modified cementitious mortar, Epoxy resin mortar, Acrylic modified cementitious mortar, Flowing concrete.

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

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

Course Outcomes for First Year Second Semester Course	
Course Code: M16 ST 1211	
Course Title: REPAIR AND REHABILITATION OF STRUCTURES	
CO-1	Assess the damage intensity
CO-2	Select proper rehabilitation and repair measures for different types of deteriorations.
CO-3	Apply the Seismic Retrofitting techniques on reinforced concrete building.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

Chinna Amiram, Bhimavaram-534204

Estd: 1980

SYLLABUS: ADVANCED DESIGN OF STRUCTURES (M16 ST 1206)

(VIVA-VOCE)

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

Course Outcomes for First Year Second Semester Course	
Course Code: M16 ST 1206	
Course Title: ADVANCED DESIGN OF STRUCTURES	
CO-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.

COMPUTER SCIENCE AND ENGINEERING

SYLLABUS: MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (M16 CST 1101)

(Common for M.Tech (CST, IT))

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.

Context Free Languages: Context –Free Grammar – Regular Languages and Context-Free Grammar – Pushdown Automata – Pushdown Automata and Context-Free Grammar – Properties of Context-Free Languages – pushdown automata and Equivalence with Context Free Grammars.

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

Course Outcomes for First Year First Semester Courses	
Course Code: M16 CST 1101	
Course Title: Mathematical Foundations of Computer Science	
CO-1	Critical, logical-mathematical reasoning
CO-2	Ability to apply mathematical knowledge and logic in solving problems.
CO-3	Understanding of formal grammar analysis and compilation.

SYLLABUS: DATA STRUCTURES & ALGORITHMS (M16 CST 1102)

(Common for M.TECH (CST, IT))

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.

Trees: Implementation and traversal of trees, Binary Trees and Binary search trees in C++, Concepts of AVL Trees, Splay Trees and B-Trees.

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.

Graph Algorithms: Representation of graph Topological Sort, shortest-path Algorithm, Network flow problem, Minimum spanning tree algorithm, Applications of Depth – First search, Introduction to NP-Completeness.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CST 1102	
Course Title: Data Structures & Algorithms	
CO-1	Be able to write programs and class libraries given a specification;
CO-2	Implement various data structures.
CO-3	Implement and analyze various sorting algorithms.
CO-4	Understand abstract data types and how they are implemented in C programming language.

SYLLABUS: ADVANCED DATA BASE MANAGEMENT SYSTEMS (M16CST 1103)

(Common for M.Tech (CST, IT))

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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CST 1103	
Course Title: Advanced Data Base Management Systems	
CO-1	Understanding of DBMS.
CO-2	Design database using ER model and refine the design by enforcing functional dependencies, integrity constraints and normalization
CO-3	Write queries using SQL
CO-4	Implement procedures and triggers

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Estd: 1980

SYLLABUS: ADVANCED OPERATING SYSTEMS (M16 CST 1104)

Introduction To Operating Systems, Types Of Operating Systems, Operating System Structures. Operating-System Services, System Calls, Virtual Machines, Operating System Design and Implementation.

Process Management: Process Concepts, Operations on Processes, Cooperating Processes, Threads, Inter Process Communication, Process Scheduling, Scheduling Algorithms, Multiple -Processor Scheduling. Thread Scheduling.

Process Synchronization & Deadlocks: The Critical Section Problem, Semaphores, and Classical Problems Of Synchronization, Critical Regions, Monitors, Deadlocks,-System Model, Deadlocks Characterization, Methods For Handling Deadlocks, Deadlock- Prevention, Avoidance, Detection, & Recovery from Deadlocks.

Memory Management & File System Implementation: Logical Versus Physical Address Space, Paging And Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Thrashing, File System Implementation -Access Methods, Directory Structure, Protection, File System Structure, Allocation Methods, Free Space Management, Directory Management, Device Drivers

Distributed Operating Systems: Distributed System Goals, Types Of Distributed Systems, and Styles & Architecture Of Distributed Systems, Threads, Virtualization, Clients, Servers, Code Migration, and Communication in Distributed Systems.

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

Fault Tolerance, Security: Introduction To Fault Tolerance, Process Resilience,, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, Recovery, Secure Channels, Access Control, Security Management

Course Outcomes for First Year First Semester Course	
Course Code: M16 CST 1104	
Course Title: Advanced Operating Systems	
CO-1	Students understands the concept of Distributed systems, Process Synchronization, File structure and shared memory in Distributes operating systems

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Estd: 1980

SYLLABUS: COMPUTER ORGANIZATION AND ARCHITECTURE (M16 CST 1105)

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: Evolution of Computer Systems, Parallelism in Uni- processor System, Parallel Computer Structures, Architectural Classification Schemes, Parallel Processing Applications.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CST 1105	
Course Title: Computer Organization & Architecture	
CO-1	Basic structure of a digital computer
CO-2	The organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.

SYLLABUS: E-COMMERCE (M16 CST 1106)

Introduction: Electronic Commerce-Frame Work, Anatomy of E-Commerce Applications, E-Commerce Consumer Applications, E-Commerce Organization Applications. Consumer Oriented Electronic Commerce - Mercantile Process Models, Digital Economy and e- business Models

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.

Intra Organizational Commerce, Macro Forces And Internal Commerce, Work Flow Automation and Coordination, Customization And Internal Commerce, Supply Chain Management. Business Cases for Document Library, Digital Document Types, Corporate Data Ware-Houses.

Advertising And Marketing: Information Based Marketing, Advertising On Internet, Online Marketing Process, Market Research. Consumer Search and Resource Discovery, Information Search and Retrieval, Commerce Catalogues, Information Filtering.

Multimedia-Key Multimedia Concepts, Digital Video and Electronic Commerce, Desktop Video Processing, Desktop Video Conferencing.

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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CST 1106	
Course Title: E-Commerce	
CO-1	Will be able to analyze the concept of electronic market and market place.
CO-2	Able to understand the business standards and security issues
CO-3	Able understand e-commerce business models and applications, issues of e-commerce business models.

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ChinnaAmiram, Bhimavaram-534204. (AP)

Estd: 1980

SYLLABUS: EMBEDDED SYSTEMS (M16 CST 1107)

Examples of Embedded Systems – Typical Hardware – Memory – Microprocessors –Busses – Direct Memory Access – Introduction to 8051 Microcontroller – Architecture- Instruction set – Programming.

Microprocessor Architecture – Interrupt Basics – The Shared-Data problem – Interrupt Latency.

Round–Robin Architecture - Round–Robin with Interrupts Architecture - Function-Queue- Scheduling Architecture – Real-Time Operating Systems Architecture – Selection of Architecture.

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

Message Queues – Mailboxes – Pipes – Timer Functions – Events – Memory Management –Interrupt Routines in RTOS Environment.

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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CST 1107	
Course Title: Embedded Systems	
CO-1	An ability to design systems, components, or processes for broadly-defined engineering technology problems.
CO-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.
CO-3	Design, test and critically evaluate embedded solutions to real world situations using digital components (sequential and combinatorial).
CO-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.
CO-5	Develop software systems for embedded devices using assembler code

Estd: 1980

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SYLLABUS: IMAGE PROCESSING (M16 CST 1108)

Fundamentals of Image Processing: Image Acquisition, Image Model, Sampling, Quantization, Relationship between Pixels, Distance Measures, Connectivity, Image Geometry, Photographic Film. Histogram: Definition, Decision Of Contrast Basing On Histogram, Operations Basing on Histograms Like Image Stretching, Image Sliding, Image Classification. Definition and Algorithm of Histogram Equalization.

Image Transforms: A Detail Discussion On Fourier Transform, DFT,FFT, Properties WALSH Trans Form , 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 Enhancement: Design of Low Pass, High Pass, EDGE Enhancement, Smoothening Filters in Frequency Domain. Butter Worth Filter, Homomorphic Filters in Frequency Domain Advantages of Filters in Frequency Domain, Comparative Study of Filters in Frequency, Domain and Spatial Domain.

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

Course Outcomes for First Year First Semester Course	
Course Code:M16 CST 1108	
Course Title: Image Processing	
CO-1	Demonstrated understanding of the basic concepts of two-dimensional signal acquisition
CO-2	Demonstrated understanding of spatial filtering techniques
CO-3	Demonstrated understanding of 2D Fourier transform concepts
CO-4	Demonstrated understanding of the fundamental image enhancement algorithms such as histogram modification
CO-5	Demonstrated understanding of the basic concepts of two-dimensional signal acquisition

Estd: 1980

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SYLLABUS: COMPUTER NETWORKS (M16 CST 1109)

Introduction to Computer Networks: Introduction, Network Hardware, Network Software, Reference Models, Data Communication Services & Network Examples, Internet Based Applications.

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.

Design Issues in Networks: Routing Algorithms, Congestion Control Algorithms, Net work Layer in the Internet, IP Protocol, IP Address, Subnets, and Internetworking.

Internet Transport Protocols: TRANSPORT Service, Elements of Transport Protocols, TCP and UDP Protocols, Quality of Service Model, Best Effort Model, Network Performance Issues.
Over View of DNS, SNMP, Electronic Mail, FTP, TFTP, BOOTP, HTTP Protocols, World Wide Web, Firewalls.

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.

Advanced Concepts in Networks: Over View of Cellular Networks, Adhoc Networks, Mobile Adhoc Networks, Sensor Networks, Virtual Private Networks .Delay Tolerant Networks DTN, Ipvs.

Course Outcomes for First Year First Semester Course	
Course Code:M16 CST 1109	
Course Title: Computer Networks	
CO-1	Independently understand basic computer network technology.
CO-2	Identify the different types of network topologies and protocols.
CO-3	Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
CO-4	Identify the different types of network devices and their functions within a network
CO-5	Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.
CO-6	Have an understanding of protocols in computer networks
CO-7	Understand different protocols of different layers of computer networks.

Estd: 1980

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SYLLABUS: CLOUD COMPUTING (M16 CST 1110)

Cloud Computing Basics - Cloud Computing Overview, Applications, Intranets and the Cloud, First Movers in the Cloud. The Business Case for Going to the Cloud - Cloud Computing Services, Business Applications, Deleting Your Datacenter, Salesforce.com, Thomson Reuters.

Organization and Cloud Computing - When You Can Use Cloud Computing, Benefits, Limitations, Security Concerns, Regulatory Issues, Cloud Computing with the Titans - Google, EMC, NetApp, Microsoft, Amazon, Salesforce.com, IBM Partnerships.

Hardware and Infrastructure - Clients, Security, Network, Services. Accessing the Cloud - Platforms, Web Applications, Web APIs, Web Browsers. Cloud Storage - Overview, Cloud Storage Providers, Standards - Application, Client, Infrastructure, Service.

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.

Migrating to the Cloud - Cloud Services for Individuals, Cloud Services Aimed at the Mid- Market, Enterprise-Class Cloud Offerings, Migration, Best Practices and the Future of Cloud Computing - Analyze Your Service, Best Practices, How Cloud Computing Might Evolve.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CST 1110	
Course Title: Cloud Computing	
CO-1	Understanding the systems, protocols and mechanisms to support cloud computing
CO-2	Develop applications for cloud computing
CO-3	Understanding the hardware necessary for cloud computing
CO-4	Design and implement a novel cloud computing application

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Estd: 1980

SYLLABUS: GRID COMPUTING (M16 CST 1111)

Introduction: Introduction to Parallel, Distributed Computing, Cluster Computing and Grid Computing, Characterization of Grids, Organizations and their Roles, Grid Computing Road Maps.

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

Grid Monitoring: Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- GridICE - JAMM -MDS-Network Weather Service-R-GMA-Other Monitoring Systems- Ganglia and GridM

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

Data Management And Grid Portals: Data Management, Categories and Origins of Structured Data, Data Management Challenges, Architectural Approaches, Collective Data Management Services, Federation Services, Grid Portals, First-Generation Grid Portals, Second Generation Grid Portals.

Semantic Grid and Autonomic Computing: Meta data and Ontology in the Semantic Web, Semantic Web services, Layered structure of the Semantic Grid, Semantic Grid activities, Autonomic Computing

Grid Security and Resource Management: Grid Security, A Brief Security Primer, PKI- X509 Certificates, Grid Security, Scheduling and Resource Management, Scheduling Paradigms, Working principles of Scheduling, A Review of Condor, SGE, PBS and LSF- Grid Scheduling with QoS.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CST 1111	
Course Title: Grid Computing	
CO-1	To understand the genesis of grid computing
CO-2	To know the application of grid computing
CO-3	To learn the technology and tool kits for facilitating grid computing

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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Estd: 1980

SYLLABUS: COMPUTER GRAPHICS & VISUAL COMPUTING (M16 CST 1112)

Introduction: Computer Graphics and their applications, Computer Aided Design- Computer Art, Entertainment, Education and Training, Graphical User Interfaces; Over view of Graphics systems: Video Display Devices, Raster Scan systems, random scan systems, Graphics monitors and workstations, Input devices, hard copy devices, GUI and Interactive Input Methods, Windows and Icons , Virtual Reality Environments, Graphics software

Output primitives: Points and Lines, **,** Line and Curve Attributes-Color and Gray scale levels Line Drawing Algorithms, Loading the Frame buffer, Line function, Circle Generating Algorithms, Ellipse Generating Algorithms, Other Curves, Parallel Curve Algorithms, Curve Functions , Pixel Addressing, Area Fill Attributes, Filled Area Primitives, Filled Area Functions, Cell Array, Character Generation, Character Attributes, Bundled Attributes, Inquiry Functions , Antialiasing

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

Two & Three Dimensional Transformations: Two Dimensional Transformations: Basic Transformations, Matrix Representations, Homogeneous Coordinates, Composite Transformations, Other Transformations, Transformations between Coordinate Systems, Affine Transformations -, Transformation Functions-, Raster methods for Transformation Three Dimensional Transformatio**ns:** Translation-, Rotation, scaling, Other Transformations, 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.

Visual Transformation & Projection: Graphics pipeline, perception and color models, camera models, transformations and projection, projections, lighting, shading, global illumination, texturing, sampling theorem, Fourier transforms, image representations, convolution, linear filtering, diffusion, nonlinear filtering, edge detection, optical flow, image and video compression, Creation of Visual Effects Optical Flow Video Compression, Radon Transform Texture

Course Outcomes for First Year First Semester Course	
Course Code:M16 CST 1112	
Course Title: Computer Graphics & Visual Computing	
CO-1	Learn basic and fundamental computer graphics techniques
CO-2	Represent and implement images and objects using 3D representation.
CO-3	Design develop surface detection using various detection methods
CO-4	Choose various illumination models for provides effective standards of objects
CO-5	Design of develop effective computer animations
CO-6	Design of various projections

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ChinnaAmiram, Bhimavaram-534204. (AP)

Estd: 1980

SYLLABUS: DATA STRUCTURES& PROGRAMMING LAB (M16 CST 1113)

(Common for M.Tech (CST, IT))

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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CST 1113	
Course Title: Data Structures &Programming Lab	
CO-1	Implement Linear data structures
CO-2	Non-linear data structures
CO-3	Sorting techniques Design of various projections

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SYLLABUS: DATA BASE MANAGEMENT LAB (M16 CST 1114)

(Common for M.Tech (CST, IT))

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

Course Outcomes for First Year First Semester Course	
Course Code:M16 CST 1114	
Course Title: Data Base Management Lab	
CO-1	Able to design DBMS projects including Normalization
CO-2	Able to implement a DBMS project with appropriate triggers, procedures and front end.

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SYLLABUS: ARTIFICIAL INTELLIGENCE (M16 CST 1201)

Introduction: Artificial Intelligence, AI Problems, AI Techniques, the Level of the Model, Criteria for Success. Defining the Problem as a State Space Search, Problem Characteristics, Production Systems, Search: Issues in The Design of Search Programs, Un-Informed Search, BFS, DFS; Heuristic Search Techniques: Generate-And- Test, Hill Climbing, Best-First Search, A* Algorithm, Problem Reduction, AO*Algorithm, Constraint Satisfaction, Means- Ends Analysis.

Knowledge Representation: Procedural Vs Declarative Knowledge, Representations & Approaches to Knowledge Representation, Forward Vs Backward Reasoning, Matching Techniques, Partial Matching, Fuzzy Matching Algorithms and RETE Matching Algorithms; Logic Based Programming- AI Programming languages: Overview of LISP, Search Strategies in LISP, Pattern matching in LISP , An Expert system Shell in LISP, Over view of Prolog, Production System using Prolog

Symbolic Logic: Propositional Logic, First Order Predicate Logic: Representing Instance and is-a Relationships, Computable Functions and Predicates, Syntax & Semantics of FOPL, Normal Forms, Unification &Resolution, Representation Using Rules, Natural Deduction; Structured Representations of Knowledge: Semantic Nets, Partitioned Semantic Nets, Frames, Conceptual Dependency, Conceptual Graphs, Scripts, CYC.

Reasoning under Uncertainty: Introduction to Non-Monotonic Reasoning, Truth Maintenance Systems, Logics for Non-Monotonic Reasoning, Model and Temporal Logics; Statistical Reasoning: Bayes Theorem, Certainty Factors and Rule-Based Systems, Bayesian Probabilistic Inference, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic: Crisp Sets ,Fuzzy Sets, Fuzzy Logic Control, Fuzzy Inferences & Fuzzy Systems.

Experts Systems: Overview of an Expert System, Structure of an Expert Systems, Different Types of Expert Systems- Rule Based, Model Based, Case Based and Hybrid Expert Systems, Knowledge Acquisition and Validation Techniques, Black Board Architecture, Knowledge Building System Tools, Expert System Shells, Fuzzy Expert systems.

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

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CST 1201	
Course Title: Artificial Intelligence	
CO-1	Able to learn artificial intelligence techniques
CO-2	Understand the concept of machine learning.

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SYLLABUS: OBJECT ORIENTED SOFTWARE ENGINEERING (M16 CST 1202)

Introduction to Object Oriented Software Engineering

Nature Of The Software, Types Of Software , Software Engineering Projects, Software Engineering Activities, Software Quality, Introduction To Object Orientation, Concepts Of Data Abstraction, Inheritance & Polymorphism, Software Process Models-Waterfall Model, The Opportunistic Model , The Phased Released Model, The Spiral Model, Evolutionary Model, The Concurrent Engineering Model

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.

Unified Modeling Language & Use Case Modeling: Introduction To UML, Modeling Concepts, Types Of UML Diagrams With Examples; User-Centred Design, Characteristics Of Users, Developing Use Case Models Of Systems, Use Case Diagram, Use Case Descriptions, The Basics Of User Interface Design, Usability Principles, User Interfaces.

Class Design and Class Diagrams: Essentials Of UML Class Diagrams, Associations And Multiplicity, Other Relationships, Generalization, Instance Diagrams, Advanced Features Of Class Diagrams, Interaction And Behavioral Diagrams: Interaction Diagrams, State Diagrams, Activity Diagrams, Component And Deployment Diagrams.

Software Design And Architecture: The Process Of Design, Principles Leading To Good Design, Techniques For Making Good Design Decisions, Writing A Good Design Document., Pattern Introduction, Design Patterns: The Abstraction-Occurrence Pattern, General Hierarchical Pattern, The Play-Role Pattern, The Singleton Pattern, The Observer Pattern, The Delegation Pattern, The Adaptor Pattern, The Façade Pattern, The Immutable Pattern, The Read-Only Interface Pattern And The Proxy Pattern; Software Architecture Contents Of An Architecture Model, Architectural Patterns: The Multilayer, Client-Server, Broker, Transaction Processing, Pipe & Filter And MVC Architectural Patterns

Software Testing: Overview Of Testing, Testing Concepts, Testing Activities, Testing Strategies, Unit Testing, Integration Testing, Function Testing, Structural Testing, Class Based Testing Strategies, Use Case/Scenario Based Testing, Regression Testing, Performance Testing, System Testing, Acceptance Testing, Installation Testing, OO Test Design Issues, Test Case Design, Quality Assurance, Root Cause Analysis, Post-Mortem Analysis.

Software Project Management: Introduction To Software Project Management, Activities Of Software Project Management, Structure Of Project Plan, Software Engineering Teams, Software Cost Estimation, Project Scheduling, Tracking And Monitoring.

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

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Estd: 1980

Course Outcomes for First Year Second Semester Course	
Course Code :M16 CST 1202	
Course Title: Object Oriented Software Engineering	
CO-1	Relate object oriented concepts representation through artifacts of UML.
CO-2	Build and relate classes, their relationships and collaborations (CRC) (for any case study).
CO-3	Generate the list and order of activities carried out for each behavior exhibited by any system
CO-4	Design advanced behavioral concepts to deploy the model
CO-5	Apply the project development activities of software engineering

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SYLLABUS: COMPILER DESIGN (M16 CST 1203)

Introduction: Introduction to Compilers and Language processors, , Programming Language basics, Extended Backus- Naur Form Syntax Notation, Applications of Compiler Technology, Design of New Computer Architecture, Structure & Different Phases of a Compiler, Review of Compiler Structure, Structure of Optimizing Compilation.

Finite Automata & Lexical Analysis: introduction to Lexical Analysis, Lexical Analyzers, Approaches to design Lexical Analyzers, Language for specifying lexical analyzers, Introduction to Finite automata, Regular Expressions & Languages, Recognition of Tokens, Transition Diagrams, Look ahead Operator, Implementation of lexical analyzers, Lexical Analyzer Generator LEX.

Syntax Analysis: Syntactic Specification of Programming Languages, Context Free Grammars & Languages, Introduction to Parsers, Parser Generators, Yacc, Creating Yacc Lexical Analyzer with LEX, Basic Parsing Techniques: Shift Reduce Parsing, OperatorPrecedence Parsing, Top-down Parsing, Recursive Descent Parsing, Predictive Parsers, LR Parsers: SLR, LALR & Canonical LR parsing, Construction of Parse Tree, Error Recovery inParsers.

Semantic Analysis: Semantic Actions, Syntax Directed Translations, Translation on the parse Tree, Implementation of Syntax Directed Translator, Intermediate Codes, Syntax Directed translation to Postfix code, Syntax Trees, Intermediate Code Generation, Three Addr5ess Code-Translation of Expressions, Type Checking& Type Conversions.

Code Optimization: Principal sources of Code Optimization, Loop Optimization, Basic Blocks& Flow Graphs, DAG Representation of Basic Blocks, Applications of DAG, Local Optimization, Unreachable Code Elimination, Dead Code Elimination, Data Flow Analysis, Data Flow Equations & Computations, and Peep-Hole Optimization. Machine Dependent Optimizations, Overview of Informal Compiler Algorithm Notation (ICAN), If Simplification, Loop Simplification, Loop Inversion, Branch Optimization and Prediction

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

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Compilers, Future Trends In Compiler Design and Implementations.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CST 1203	
Course Title: Compiler Design	
CO-1	To acquire the knowledge of modern compiler & its features.
CO-2	To learn the new code optimization techniques to improve the performance of a program in terms of speed & space.
CO-3	To use the knowledge of patterns, tokens & regular expressions

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Estd: 1980

SYLLABUS: DATA WAREHOUSING AND DATA MINING (M16 CST 1204)

Introduction to Data Mining: Evolution of I T 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, and Density Based Methods, Grid Based Methods, Evaluation of Clustering Solutions.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CST 1204	
Course Title: Data Warehousing &Data Mining	
CO-1	Extract knowledge using data mining techniques
CO-2	At the closing stage of the course, students will be able to analyze different operations and techniques involved in data mining.

Estd: 1980

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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SYLLABUS: PARALLEL PROGRAMMING (M16 CST 1205)

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.

Performance Analysis: Introduction, Execution Time, Speedup, Linear and Super linear Speedup, Efficacy and Efficiency, Amdahls Law and Amdahl Effect, Gustafson-Barsiss Law, Minsky's Conjecture, The Karp-Flatt Metric, The Iso-Efficiency Metric, Iso-Efficiency Relation, Cost and Scalability.

Parallel Computational Models: Flynns Taxonomy, PRAM, EREW, CREW, ERCW, CRCW, Simulating CRCW, CREW and EREW, PRAM Algorithms.

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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CST 1205	
Course Title: Parallel Programming	
CO-1	Recall fundamental concepts of parallelism
CO-2	Design and analyze the parallel algorithms for real world problems and implement them on available parallel computer systems.
CO-3	Reconstruction of emerging parallel algorithms with MPI.
CO-4	Compute contemporary parallel algorithms.

Estd: 1980

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SYLLABUS: SEMANTIC WEB (M16 CST 1206)

Introduction to Semantic Web: Introduction, Semantic Web, URI, RDF, Ontologies, Inferences, DAML, Semantic Web Languages, Semantic Annotation, Classification, Information Extraction, Ontology Assignment, XML, Syntax of XML,XML Schema, Semantic Web Applications to E-Commerce, E-Government and E-Banking, Semantic Web in Life Sciences, RIF Applications.

Semantic Web Structure: Semantic Web Layers Architecture, Different Layers, Match Making, Multi Information Retrieving, Digital Signature, Semantic Memory, Semantic Web Enabled Service Oriented Architecture (SESA), SESA Services, SESA Middle Ware.

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

Web Ontology Languages: OWL Syntax, OWL Species, OWL2 Standards, OWL Formal Semantics, Description Logics, Model Theoretic Semantics of OWL, SWRL, Semantic Web Rules, Languages, Syntax of SWRL, Rules and Safety, Implementation & Applications.

Ontology Engineering: Requirement Analysis, Ontology Knowledge Creation, Ontologies and Rules: Definition of a Rule, Datalog as First order Rule Language, Combining Rules with OWDL, Rule Interchanging Formats RIF, Quality Assurance of Ontologies, Modular Ontologies, Divide and Conquer, Software Tools.

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 OWLDL.

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

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CST 1206	
Course Title: Semantic Web	
CO-1	Able to understand the rationale behind Semantic web.
CO-2	Understand the concept structure of the semantic web technology and how this technology revolutionizes the World Wide Web and its uses.
CO-3	Able to model and query domain knowledge as ontologies defined using standards such as RDF and OWL.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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Estd: 1980

SYLLABUS: BIG DATA ANALYTICS (M16 CST 1207)

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

Map-Reduce and the New Software Stack: Distributed File Systems .Physical Organization of Compute Nodes, Large-Scale File-System Organization, Map-Reduce features: Map Tasks, Grouping by Key, Reduce Tasks, Combiners, Map-Reduce Execution, Coping With Node Failures, Algorithms Using Map-Reduce for Matrix multiplication, Relational Algebra operations, Workflow Systems, Recursive Extensions to Map-Reduce

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 l and Management Stream Source, StreamQueries, and issues, Sampling Data in a Stream , Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Ones in a Window, DecayingWindows

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

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CST 1207	
Course Title: Big Data Analytics	
CO-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.
CO-2	To be able to analyze the various technologies & tools associated with Big Data.
CO-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.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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Estd: 1980

SYLLABUS: DATABASE SECURITY (M16 CST 1208)

Introduction to Database Security: Fundamental Data Security Requirements, Data Security Concerns, Compliance Mandates, Security Risks, Developing Enterprise Security Policy, Defining a Security Policy, Implementing a Security Policy, Techniques to Enforce Security

Database Access Control: User Authentication, Protecting Passwords, Creating Fixed Database Links, Encrypting Database Link Passwords, Using Database Links Without Credentials, Using Database Links And Changing Passwords, Auditing With Database Links, Restricting A Database Link With Views, Trust Management & Negotiation

Database Security Issues: Database Security Basics, Security Checklist, Reducing Administrative Effort, Applying Security Patches, Default Security Settings, Secure Password Support, Enforcing Password Management, Protecting The Data Dictionary, System and Object Privileges, Secure Data Outsourcing, Security in Advanced Database Systems, Security in Data Warehousing and OLAP Systems, Managing Enterprise User Security

Framework For Database Security: Security for Workflow Systems, Secure Semantic Web Services, Spatial Database Security, Security Reengineering, Strong Authentication, Single Sign-On, Public Key Infrastructure (PKI) Tools, Configuring SSL on the Server, Certificates, Using Kerberos for Authentication

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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CST 1208	
Course Title: Database Security	
CO-1	Able to understand the database security framework
CO-2	Will be able to learn database access control
CO-3	Will be able to understand database security techniques.
CO-4	Will be able to implement security for databases.

Estd: 1980

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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SYLLABUS: MOBILE COMPUTING (M16 CST 1209)

Introduction to Mobile Computing, Overview of Mobile Technologies, Limitations, The Ubiquitous Network, Architecture for Mobile Computing, Three-Tier Architecture, Design Considerations for Mobile Computing, Mobile Computing Through Internet, Mobile Devises and Mobile-Enabled Applications.

Introduction To Wireless Networking, Various Generations of Wireless Networks, Wireless LANs, Advantages and Disadvantages of WLANs, Fixed Network Transmission Hierarchy, Differences in Wireless and Fixed Telephone Networks, Traffic Routing in Wireless Networks, WAN Link Connection Technologies, Cellular Networks.

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.

Emerging Technologies: Introduction - Bluetooth - Radio Frequency Identification (RFID), WIMAX -Mobile IP - Ipv6 - Java Card, TCP/IP in the Mobile Setting, GSM and GPS

Data Management Issues, Data Replication For Mobile Computers, Adaptive Clustering for Mobile Wireless Networks, File System, Disconnected Operations, Data Services in GPRS - Applications for GPRS - Limitations - Billing and Charging.

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

Introduction to Mobile IP, Introduction To Wireless Application Protocol, Application Layer MMS - GPRS Applications, Short Message Service (SMS): Mobile Computing Over SMS - SMS - Value Added Services Through SMS -Accessing the SMS Bearer.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CST 1209	
Course Title: Mobile Computing	
CO-1	A working understanding of the characteristics and limitations of mobile hardware devices including their user-interface modalities
CO-2	The ability to develop applications that are mobile-device specific and demonstrate current practice in mobile computing contexts.
CO-3	A comprehension and appreciation of the design and development of context-aware solutions for mobile devices.

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SYLLABUS: SOFT COMPUTING (M16 CST 1210)

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 Defuzzifications, 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

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CST 1210	
Course Title: Soft Computing	
CO-1	Able to understand genetic algorithm fundamentals and its operators and procedure
CO-2	Understand artificial neural network model and its activation functions
CO-3	Understand different operations of GA

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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SYLLABUS: CLUSTER COMPUTING (M16 CST 1211)

Introduction: Overview of Cluster Computing, the Role of Clusters, Definition and Taxonomy Of Parallel Computing, Hardware System Structure, Node Software, Resource Management, Distributed Programming, Limitations

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

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

Network Software: TCP/IP, Sockets, Higher Level Protocols, Distributed File systems, Remote Command Execution

Cluster Setup: Installation & Configuration, System Access Models, Assigning Names, Installation of Node Software, Basic System Administration

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

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CST 1211	
Course Title: Cluster Computing	
CO-1	Have knowledge of virtual technologies and Service-oriented architecture
CO-2	Have knowledge of Architecture for Cluster Computing

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204. (AP)

Estd: 1980

SYLLABUS: PERVASIVE COMPUTING (M16 CST 1212)

Pervasive Computing: Introduction to Ubiquitous Computing (Popularly known as Pervasive Computing), Evolution of Pervasive Computing, Pervasive Computing Principles: Decentralization, Diversification, Connectivity, Simplicity, Pervasive Computing Characteristics, Pervasive Information Technology

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 Connectivity: Protocols, Security, Network Management, Mobile Internet, WAN: Cellular Basics, Major Digital Cellular Systems, Advanced Cellular Radio Standards, Short Range Wireless Communication: DECT, Bluetooth, Irda, Home Networks.

Pervasive Applications : Home Services: System View, Communications, Home Automation, Energy and Security Services, Remote Home Health Care Services, Business Services, Healthcare Management, Consumer Services: Interactive Advertisement, Loyalty, Shopping, Payment Services

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

Security Issues in Pervasive Computing: Importance of Security, Cryptographic Patterns and Methods - Light Weight Cryptography -Light Weight Symmetric and Asymmetric Cryptographic Algorithms, Cryptographic Tools - Hash, MAC, Digital Signatures

Mobile Internet and Web Services: WAP Architecture, Wireless Application Environment: Wireless Markup Language, WAP Binary XML Content Format, WML Script, XHTML Mobile Proile, I-Mode, Web Services Architecture: WSDL, ADDI, SOAP, Web Services Security, Web Services For Remote Portals

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CST 1212	
Course Title: Pervasive Computing	
CO-1	Identify distinguishing features of the different mobile device categories,
CO-2	Understand the role of the Wireless Application Protocol in enabling mobile devices to access the Internet
CO-3	Able to understand elementary to medium-level (complexity-wise) user interface applications for all three platforms.

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Estd: 1980

SYLLABUS: DATA WAREHOUSING & MINING LAB (M16 CST 1213)

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

1. Demonstration of preprocessing on some datasets eg. Student.aarf/ labor.aarf/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

Course Outcomes for First Year Second Semester Course	
Course Code:M16 CST 1213	
Course Title: Data Warehousing &Mining Lab	
CO-1	Demonstrated understanding of the basic concepts of two-dimensional signal acquisition
CO-2	Demonstrated understanding of spatial filtering techniques
CO-3	Demonstrated understanding of 2D Fourier transform concepts
CO-4	Demonstrated understanding of the fundamental image enhancement algorithms such as histogram modification

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Estd: 1980

SYLLABUS: OBJECT ORIENTED SOFTWARE ENGINEERING LAB (M16 CST 1214)

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
2. A Requirements Analysis Document.
3. A System Requirements Specification.
4. A Software Requirements Specification.
5. A design document
a. A Software Design Description and a System Design Document.
6. A test specification.
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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CST 1214	
Course Title: OOSE Lab	
CO-1	Students can design and implement complex software solutions. and test and document software.
CO-2	They are capable of working as part of a software team and develop significant projects

ELECTRONICS AND COMMUNICATIONS ENGINEERING

SYLLABUS: COMMUNICATION THEORY (M16 CS 1101)

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; NY Quist 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

Course outcomes for First Year First Semester Course	
Course Code: M16 CS 1101	
Course Title: COMMUNICATION THEORY	
CO-1	AM transmission and reception
CO-2	FM and PM transmission and reception, pulse modulation, noise
CO-3	Digital communication, quantization, coding, digital modulation techniques, ISI
CO-4	Different estimation methods.

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Estd: 1980

SYLLABUS: COMMUNICATION TECHNIQUES (M16 CS 1102)

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.

Spread Spectrum Systems: PN sequences, DS spread spectrum systems; FH spread spectrum systems and performance of FHSS in AWGN – Synchronization – Jamming considerations – Commercial Applications – Cellular subsystems.

Course outcomes for First Year First Semester Course	
Course Code: M16 CS 1102	
Course Title: COMMUNICATION TECHNIQUES	
CO-1	Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.
CO-2	Perform the time and frequency domain analysis of the signals in a digital communication system.
CO-3	Select the blocks in a design of digital communication system.
CO-4	Select the relevant digital modulation technique for specific application.
CO-5	Choose the coding technique for minimum errors in transmitting information.
CO-6	Ability to use channel coding techniques (such as block & convolutional codes) in communication systems.
CO-7	Ability to use modulation techniques (such as frequency & phase-shift keying) in communication systems.
CO-8	Analyze Performance of spread spectrum communication system.

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Estd: 1980

SYLLABUS: SATELLITE COMMUNICATION AND PHASED ARRAYS (M16 CS 1103)

Introduction: Kepler's Laws of motion, Orbital aspects of Satellite Communications, Look Angle and Orbit determinations, Orbital effects in communication system Performance, Space craft subsystems, AOCS, TTC&M, Power system, Satellite transponder, spacecraft Antennas, Satellite Link Design-- System Noise temperature and G/T ratio - Design of downlink, Uplink - Design of satellite links for specified C/N, Implementation of error Detection on satellite links.

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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CS 1103	
Course Title: SATELLITE COMMUNICATION AND PHASED ARRAYS	
CO-1	The students will learn the dynamics of the satellite in the orbit.
CO-2	Understand communication satellite design and how analog and digital technologies are used for satellite communication networks.
CO-3	The students will be able to design satellite uplink and down link and calculate link budgets.
CO-4	Understand the operation of Earth station equipment, MSAT and VSAT networks.
CO-5	The students will understand the concept of phased arrays

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Estd: 1980

SYLLABUS: DIGITAL SIGNAL PROCESSING (M16 CS 1104)

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.

Course Outcomes for First Year First Semester Course	
Course code: M16 CS 1104	
Course Title: DIGITAL SIGNAL PROCESSING	
CO-1	Using filter optimization techniques students will be able to design a filter with Least Mean Square error.
CO-2	Students will be able to solve research papers related to multirate signal processing— Data Acquisition, Bandwidth reduction in a system etc.
CO-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.
CO-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.
CO-5	This course is basis for understanding Adaptive signal processing, statistical signal processing and wavelet transform subjects.

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Estd: 1980

SYLLABUS: OPTICAL FIBERS AND APPLICATIONS (M16 CS 1105)

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.

Light Sources and Detectors: Light-Emitting Diodes, Light-Emitting – Diodes Operating Characteristics, Laser Principles, Laser Diodes, Laser-Diode Operating Characteristics, Distributed
– Feedback Laser Diode, Optical Amplifiers, Fiber Laser, Vertical-Cavity Surface-Emitting Laser Diode. Principles of Photo detection, Photomultiplier, Semiconductor Photodiode, PIN Photodiode, Avalanche Photodiode.

Couplers and Connectors: Principles, Fiber end Preparation, Splices, Connectors, Source Coupling, Distribution Networks and Fiber Components, Distribution Networks, Directional Couplers, Star Couplers, Switches, Fiber Optical Isolator, Wavelength-Division Multiplexing, Fiber Bragg Gratings, Other Components : Attenuator, Circulator and Polarization Controller.

Modulation, Noise and Detection: Light-Emitting-Diode Modulation and Circuits, Laser-Diode Modulation and Circuits, Analog-Modulation Formats, Digital-Modulation Formats, Optic Heterodyne Receivers, Thermal and Shot Noise, Signal-to-Noise Ratio, Error Rates, Modal Noise, Amplifier Noise, Laser Noise, and Jitter, Additional Noise Contributors, receiver Circuit Design

System Design and Fiber Optical Applications: Analog System Design, Digital System Design, Applications of Fiber Optics.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CS 1105	
Course Title: OPTICAL FIBERS AND APPLICATIONS	
CO-1	Recognize and classify the structures of Optical fiber and types.
CO-2	Discuss the channel impairments like losses and dispersion.
CO-3	Analyze various coupling losses.
CO-4	Classify the Optical sources and detectors and to discuss their principle.
CO-5	Familiar with Design considerations of fiber optic systems.
CO-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.

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Estd: 1980

SYLLABUS: EMI / EMC (M16CS 1106)

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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CS 1106	
Course Title: EMI / EMC	
CO-1	Real-world EMC design constraints and make appropriate tradeoffs to achieve the most cost-effective design that meets all requirements.
CO-2	Designing electronic systems that function without errors or problems related to electromagnetic compatibility
CO-3	Diagnose and solve basic electromagnetic compatibility problems.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204. (AP)

Estd: 1980

SYLLABUS: MICROWAVE COMPONENTS AND NETWORKS (M16 CS 1107)

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, dB.

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, apple gate 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 □- 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.

Course Outcomes for First Year First Semester Course	
Course code: M16 CS 1107	
Course Title: MICROWAVE COMPONENTS AND NETWORKS	
CO-1	Explain the operation of different microwave signal generators and waveguide components.
CO-2	Mathematically analyze the operation of different Signal generators.
CO-3	Mathematically analyze the operation of different waveguide components using scattering matrix.
CO-4	Understand different fabrication techniques involving Microwave integrated circuits.
CO-5	Understand and implement different experimental procedures involving measurement of microwave parameters

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Estd: 1980

SYLLABUS: ADVANCED MICROPROCESSOR (M16 CS 1108)

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

8086/8088 Instruction set: Machine Language Instruction formats, Instruction set of 8086/8088, Assembler Directives and operators, Machine level programming, assembly language programming.

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.

Course Outcomes for First Year First Semester Course	
Course code: M16 CS 1108	
Course Title: ADVANCED MICROPROCESSOR	
CO-1	After completing of this subject students will learn the basics of 16 bit microprocessor.
CO-2	Understanding the microprocessor architecture assembly language programming.
CO-3	They are able to conclude the delays for 8086.

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Estd: 1980

SYLLABUS: EMBEDDED SYSTEMS (M16 CS 1109)

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 _I^2C‘, _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.

Course Outcomes for First Year First Semester Course	
Course code: M16 CS 1109	
Course Title: EMBEDDED SYSTEMS	
CO-1	Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems.
CO-2	Discuss the basics of embedded systems and the interface issues related to it.
CO-3	Learn the different techniques on embedded systems.
CO-4	Discuss the real time models, languages and operating systems.
CO-5	Analyze real time examples.

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Estd: 1980

SYLLABUS: **COMMUNICATION ENGINEERING LAB** (M16 CS 110)

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
6. Study of Antenna Radiation Patterns of E-Plane and H-Plane radiation patterns of a PyramidalHorn using a PC-based Antenna Trainer kit.
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

Course Outcomes for First Year First Semester Course	
Course code: M16 CS 1110	
Course Title: COMMUNICATION ENGINEERING LAB	
CO-1	Graduate will demonstrate the ability to identify, formulate and solve Communication engineering problems.
CO-2	Graduate will demonstrate the ability to design and conduct experiments, analyze and interpret data.
CO-3	Graduates will demonstrate the ability to design a Communication system or process as per needs and specifications
CO-4	Graduate will demonstrate the skills to use modern engineering tools, softwares and equipment to analyze problem.

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Estd: 1980

SYLLABUS: RF AND MICROWAVE ENGINEERING (M16 CS 1201)

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.

Radio Frequency and Microwave Oscillator Design: Introduction, Oscillator versus amplifier design, Oscillation conditions, Design of transistor oscillators, Generator-tuning networks.

Course outcomes for First Year Second Semester Course	
Course code: M16 CS 1201	
Course Title: RF AND MICROWAVE ENGINEERING	
CO-1	Gain knowledge and understanding of microwave analysis methods.
CO-2	Be able to apply analysis methods to determine circuit properties of passive/active microwave devices
CO-3	Know how to model and determine the performance characteristics of a microwave circuit or system using Smith chart.
CO-4	Be able to design microwave amplifiers and oscillators for required parameters such as stability, gain , noise.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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Estd: 1980

SYLLABUS: CELLULAR AND MOBILE COMMUNICATIONS (M16 CS 1202)

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 .

Course outcomes for First Year Second Semester Course	
Course code: M16 CS 1202	
Course Title: CELLULAR AND MOBILE COMMUNICATIONS	
CO-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
CO-2	Students are capable to analyze and solve problems in the field of telecommunications.
CO-3	Students will have the understanding of different generations, operations and design of wireless and mobile communications.
CO-4	Understand the concept of frequency Reuse channels, Deduce the Co-channel interference reduction factor.
CO-5	Design of Antenna system to reduce Co-channel interference. Understand adjacent channel interference, near end far end interference
CO-6	Understand cell site and mobile antennas. Understand frequency management and channel assignment strategies
CO-7	Define Handoff, Distinguish types of handoffs and evaluation of dropped call rates.
CO-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.
CO-9	Understand the information theoretical aspects (such as the capacity) of wireless channels and basic spread spectrum techniques in mobile wireless systems.

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Estd: 1980

SYLLABUS: GLOBAL POSITIONING SYSTEM AND APPLICATIONS (M16 CS 1203)

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, ionosphere error, tropospheric error, multipath, ionosphere error estimation using dual frequency GPS receiver.

Course outcomes for First Year Second Semester Course	
Course code: M16 CS 1203	
Course Title: GLOBAL POSITIONING SYSTEM AND APPLICATIONS	
CO-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).
CO-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.
CO-3	Students can understand how trilateration is used to determine a user‘s location with a GPS and how to calculate pseudo range.
CO-4	Students understand the different accuracies of consumer, mapping and survey grade GPS units and their respective research applications.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204. (AP)

Estd: 1980

SYLLABUS: TELECOMMUNICATION SWITCHING AND NETWORKS (M16 CS 1204)

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.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204. (AP)

Estd: 1980

SYLLABUS: MODELLING AND SIMULATION OF COMMUNICATION SYSTEMS (M16 CS 1205)

Simulation of Random Variables and Random Process: Univariate and multi-variate models, Transformation of random variables, Bounds and approximation, Random process models-Markov AND ARMA sequences, Sampling rate for simulation, Computer generation and testing of random numbers.

Modeling of Communication Systems: Information Sources, Formatting/Source Coding, Digital Waveforms, Line Coding, Channel Coding, Radio frequency and Optical Modulation, Demodulation and Detection, Filtering, Multiplexing/Multiple Access, Synchronization, Calibration of Simulations.

Communication Channels & Models: Fading & Multipath Channels, Almost Free-Space Channels, Finite State Channel Models, Methodology for Simulating Communication Systems Operating over Fading Channels, Reference Models for Mobile Channels: GSM, UMTS-IMT- 2000.

Estimation of Parameters in Simulation: Quality of an estimator, Estimating the Average Level of a Waveform, Estimating the Average power of a waveform, Estimating the Power Spectral Density of a process, Estimating the Delay and Phase.

Estimation of Performance Measures from Simulation: Estimation of SNR, Performance Measures for Digital Systems, Importance sampling method, Efficient Simulation using Importance Sampling, Quasi analytical Estimation. Case Studies: 16-QAM Equalized Line of Sight Digital Radio Link, CDMA Cellular Radio System.

Course Outcomes for First Year Second Semester Course	
Course code: M16 CS 1205	
Course Title: MODELLING AND SIMULATION OF COMMUNICATION SYSTEMS	
CO-1	Characterize a given engineering system in terms of its essential elements, that is, purpose, parameters, constraints, performance requirements, subsystems, interconnections and environmental context.
CO-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
CO-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.
CO-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.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204. (AP)

Estd: 1980

SYLLABUS: MODERN RADAR SYSTEMS (M16 CS 1206)

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.

Course Outcomes for First Year Second Semester Course	
Course code: M16 CS 1206	
Course Title: MODERN RADAR SYSTEMS	
CO-1	Explain fundamentals of Surveillance Radar and Design.
CO-2	Understand and analyze the operation of different tracking Radars.
CO-3	Understand and explain the waveform design concepts of Radars.
CO-4	Explain Principles of Secondary Surveillance Radar.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204. (AP)

Estd: 1980

SYLLABUS: DIGITAL IMAGE PROCESSING (M16 CS 1207)

Digital Image Fundamentals : An image model – sampling & quantization – basic relation between pixels : imaging geomentry.

Image Transforms: Properties of 2-D fourier transforms, FFT algorithm and other separable image transforms, Walsh transforms, Hadamard, Cosine, Haar, Slant Transforms, RL Transforms and their properties.

Image Enhancement & Restoration: Spatial domain methods, Frequency domain methods, Histogram Modification technique, Neighborhood averaging, Median filtering, Low pass filtering, Averaging of Multiple Images, Image sharpening by differentiation, High pass Filtering, Degradation model for Continuous functions, Discrete Formulation, Diagonalization of Circulant and Block – Circulant Matrices, Effects of Diagonalization, Constrained and unconstrained Restorations Inverse filtering, Wiener Filter, Constrained least Square Restoration.

Image Encoding: Objective an subjective Fidelity Criteria, 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.

Course Outcomes for First Year Second Semester Course	
Course code: M16 CS 1207	
Course Title: DIGITAL IMAGE PROCESSING	
CO-1	Describe different modalities and current techniques in image acquisition
CO-2	Describe how digital images are represented and stored efficiently depending on the desired quality, color depth, dynamics
CO-3	Use the mathematical principles of digital image enhancement
CO-4	Describe and apply the concepts of feature detection and contour finding algorithms.
CO-5	Analyze the constraints in image processing when dealing with larger data sets.

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Estd: 1980

SYLLABUS: APPLICATION SPECIFIC INTEGRATED CIRCUITS (ASIC) (M16 CS 1209)

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.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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Estd: 1980

SYLLABUS: MULTIMEDIA COMMUNICATION SYSTEMS (M16 CS 1210)

Introduction: Introduction to Multimedia - Multimedia Authoring and Tools. Graphics and Image Data Representations - Color in Image and Video- fundamental Concepts in Video

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

Multimedia Networks: Computer and Multimedia Networks - Multimedia Network Communications and Applications- Wireless Networks- Content-Based Retrieval in Digital Libraries.

Course Outcomes for First Year Second Semester Course	
Course code: M16 CS 1210	
Course Title: MULTIMEDIA COMMUNICATION SYSTEMS	
CO-1	On successful completion of this course, student should be able to
CO-2	Describe technical characteristics and performance of multimedia system and terminals,
CO-3	Design creative approach in application of multimedia devices, equipment and systems,
CO-4	Carry out experiments and measurements on the multimedia systems in laboratory conditions on real components and equipment,
CO-5	Interpret and analyze measurement results obtained on the multimedia system and components
CO-6	Describe the development process and applications of the multimedia systems
CO-7	Test multimedia communication systems and equipment in real conditions.

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Estd: 1980

SYLLABUS: WAVELET TRANSFORMS AND ITS APPLICATIONS (M16 CS 1211)

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 – Multi resolution analysis (MRA) with examples.

Orthonormal Wavelets And Filter Banks: Definition of an MRA- construction of a General Orthonormal MRA – Wavelet Basis for the MRA-Digital filtering Interpretation- Examples of orthonormal Basis – Generating Wavelets- Interpreting Orthonormal MRAs for Discrete – time Signals Miscellaneous Issues Related to PRQMF Filter Banks-Generating Scaling Functions and Wavelets from Filter Banks – Generating Scaling functions and Wavelets from Filter coefficients – Problems.

Alternative Wavelet Transforms: Bi-orthogonal Wavelet Bases – Filtering Relations for Orthogonal Filters-Examples of Bi-orthogonal Scaling Functions and Wavelets-Two Dimensional Wavelets-Non seperable Multidimensional Wavelets- Wavelet Packets – Transform Coding – DTWT for Image Compression – Audio Compression – Video Coding Using Multi resolution Techniques.

Applications of Wavelet Transforms: Wavelet De noising – Speckle Removing – Edge Detection and Object Isolation - Image Fusion-Object Detection by Wavelet Transforms of Projections – Communication Applications – Scaling Functions as signaling pulses, Discrete Wavelet Multitone Modulation.

Course Outcomes for First Year Second Semester Course	
Course code: M16 CS 1211	
Course Title: WAVELET TRANSFORMS AND ITS APPLICATIONS	
CO-1	Understand the various transforms and their applications.
CO-2	Understand the relationship between various versions of Wavelet transform
CO-3	Apply Wavelet transforms to different applications.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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Estd: 1980

SYLLABUS: STATISTICAL SIGNAL PROCESSING (M16CS1212)

Estimating in Signal Processing: Mathematical Estimation Problem, Assessing Estimator Performance, Minimum Variance Unbiased Estimation: Unbiased Estimators, Minimum Variance Criterion, Existence of the Minimum Variance Unbiased Estimator, Finding the Minimum Variance Unbiased Estimator, Cramer Rao Lower Bound, Estimator Accuracy considerations, CRLB, CRLB for signals in White Gaussian Noise, Transformation of Parameters, Signal Processing Examples.

Maximum Likelihood Estimation: Introduction, Finding the MLE, Properties of the MLE, MLE for transformed parameters, Numerical Determination of the MLE, Asymptotic MLE, SignalProcessing Examples, Least Squares Estimation: Introduction, Least Squares Approach, Linear Least Squares, Geometrical Interpretations, Order Recursive Least Squares, Signal Processing Examples.

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.

Statistical Decision Theory: Neyman - Pearson Theorem, Receiver Operating Characteristics, Irrelevant Data, Minimum Probability of Error, Bayes Risk, Multiple Hypothesis Testing - Composite Hypothesis Testing, Composite Hypothesis Testing Approaches, Performance of GLRT, Multiple Hypothesis Testing.

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 ProcessingExample.

Course Outcomes for First Year Second Semester Course	
Course code: M16 CS 1212	
Course Title: STATISTICAL SIGNAL PROCESSING	
CO-1	Ability to characterize an estimator.
CO-2	Ability to design statistical DSP algorithms to meet desired needs
CO-3	Ability to apply vector space methods to statistical signal processing problems.
CO-4	Ability to understand Wiener filter theory and design discrete and continuous Wiener filters.
CO-5	Ability to understand Kalman Filter theory and design discrete Kalman filters.

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Estd: 1980

SYLLABUS: DIGITAL SIGNAL PROCESSING LAB (M16CS1213)

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 Descoraubler for speech an audio signal
4. Implementation of convolution encoder
5. Implementation of convolution veterbi 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

Course Outcomes for First Year Second Semester Course	
Course code: M16 CS 1213	
Course Title: DIGITAL SIGNAL PROCESSING LAB	
CO-1	Analyze signals using the discrete Fourier transform (DFT)
CO-2	Understand circular convolution, its relationship to linear convolution, and how linear convolution can be achieved via the discrete Fourier transform.
CO-3	Understand the Decimation in time and frequency FFT algorithms for efficient computation of the DFT.
CO-4	Alter the sampling rate of a signal using decimation and interpolation.
CO-5	Design digital IIR filters by designing prototypical analog filters and then applying analog to digital conversion techniques such as the bilinear transformation.
CO-6	Design digital FIR filters using the window method.

ELECTRICAL AND ELECTRONICS ENGINEERING

SYLLABUS: ADVANCED POWER SYSTEM OPERATION AND CONTROL (M16 PS 1101)

Economic operation: Economic dispatch problem of thermal units without and with losses– Gradient method-Newton method –Base point and participation factor method.

Unit Commitment Solution Methods:

Introduction to unit commitment, methods of unit commitment**:** Priority-List Methods, Dynamic- Programming Solution, Forward DP Approach, Lagrange relaxation solution.

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

Optimal Power Flow: Solution of OPF, gradient method, Newton method, linear programming method with only real power variables, linear programming with AC power flow variables, security-constrained optimal power flow.

Power system security: Contingency analysis–linear sensitivity factors–AC power flow methods–contingency selection – concentric relaxation – bounding-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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 PS 1101	
Course Title: ADVANCED POWER SYSTEM OPERATION AND CONTROL	
CO-1	Develop generation dispatching schemes for thermal and hydro units
CO-2	Apply control and compensations schemes on a power system
CO-3	Adopt contingency analysis and selection methods to improve system security

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Estd: 1980

SYLLABUS: OPTIMIZATION TECHNIQUES (M16 PS 1102)

Introduction to Optimization: Introduction, Historical Development, Engineering Applications of Optimization, Statement of Optimization Problem.

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.

Linear Programming: Introduction, Applications of Linear Programming, Standard Form of a Linear Programming, Basic Terminology and Definitions, Exceptional cases, Simplex method, Big-Mmethod, Two-phase method, Revised Simplex method, Duality, Decomposition Principle.

Non-Linear Programming-I: Unconstrained optimization-Univariate method, Pattern Directions, Hookand Jeeves Method, Powell's method, Gradient of a function, Steepest descent method, Conjugate Gradient Method, Newton‟s method, Marquardt Method,Quai-Newton Methods, Davidon-Fletcher-Powell Method, Broyden-Fletcher-Goldfarb- Shanno Method.

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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 PS 1102	
Course Title: OPTIMIZATION TECHNIQUES	
CO-1	After learning the techniques they can apply to engineering and other problems.

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Estd: 1980

SYLLABUS: ADVANCED DRIVES & CONTROL (M16 PS 1103)

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, PI and PID controllers, current control-Design procedure, phase locked loop (PLL) control-microcomputer control.

Course Outcomes for First Year First Semester Course	
Course Code: : M16 PS 1103	
Course Title: ADVANCED DRIVES&CONTROL	
CO-1	Student can design the transfer functions and obtain the performance of d.c motors
CO-2	Student can design the dq equivalent circuits of induction and synchronous motors and evaluate the performance it.
CO-3	Student can design the values of P and PI Controllers for controlling the DC and AC Motor.

SYLLABUS: ADVANCED CONTROL SYSTEM DESIGN (M16 PS 1104)

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).

Design of digital control system: Protocol of Digital controller design, Classical Compensation of Discrete-time control systems: Forward path continuous, Forward-path Digital Z-plane Synthesis approaches, Deadbeat performance.

Course Outcomes for First Year First Semester Course	
Course Code: M16 PS 1104	
Course Title: ADVANCED CONTROL SYSTEM DESIGN	
CO-1	Design the controllers for linear continuous systems using frequency domain, time domain,state feed compensation and ISE compensation
CO-2	Design the controllers for discrete-time systems using Z-plane and W-plane method
CO-3	Design the PID controller using Ziegler Nicholas tuning method
CO-4	Design the MIMO Control design

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Estd: 1980

SYLLABUS: RENEWABLE ENERGY SYSTEMS (M16 PS 1105)

Energy and Electricity: The World Energy Scene, the Environmental Impact of Energy Use, Generating Electricity, the Electrical Power System

Features of Conventional and Renewable Generation: Introduction, Conventional Sources: Coal, Gas and Nuclear, Hydroelectric Power, Wind Power, PV and Solar Thermal Electricity, Tidal Power, Wave Power, Biomass, Summary of Power Generation Characteristics, Combining Sources.

Power Balance/Frequency Control: Introduction, Electricity Demand, Power Governing, Dynamic Frequency Control of Large Systems, Impact of Renewable Generation on Frequency Control and Reliability, Frequency Response Services from Renewable, Frequency Control Modelling, Energy Storage.

Renewable Energy Generation in Power Systems: Distributed Generation, Voltage Effects, Thermal Limits, Other Embedded Generation Issues, Islanding, Fault Ride-through, Generator and Converter Characteristics.

Power System Economics and the Electricity Market: Introduction, The Costs of Electricity Generation, Economic Optimization in Power Systems., External Costs, Effects of Embedded Generation, Support Mechanisms for Renewable Energy, Electricity Trading.

The Future–Towards a Sustainable Electricity Supply System: Introduction, The Future of Wind Power, The Future of Solar Power, The Future of Bio fuels, The Future of Hydro and Marine Power, Distributed Generation and the Shape of Future Networks.

Course Outcomes for First Year First Semester Course	
Course Code: M16 PS 1105	
Course Title: RENEWABLE ENERGY SYSTEMS	
CO-1	Students will be able to understand the World Energy Generation and consumption Over thepast and present;
CO-2	Students will be able to outline the technologies that are used to harness the Energy from Conventional and Non-conventional Sources.
CO-3	Students will be able to understand power governing, dynamic frequency control of large systems, Impact of Renewable generation on Frequency control
CO-4	Students will be able to explain the Issues Regarding Renewable Energy System in PowerSystem
CO-5	Students will be able to outline the Power system economics and Electricity Market
CO-6	Students will have vision towards sustainable supply systems in Future.

SYLLABUS: POWER SYSTEM MODELING (M16 PS 1106)

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.

Reference Frame Theory: Static and rotating reference frames–transformation of variables– reference frames – transformation between reference frames–transformation of a balanced set– balanced steady state phasor and voltage equations –variables observed from several frames of reference.

Synchronous machine modeling: Voltage and Torque Equation–voltage Equation in arbitrary reference frame and rotor reference frame–Park equations-rotor angle and angle between rotor– steady state analysis– dynamic performances for torque variations-dynamic performance for three phase fault–transient stability limit – critical clearing time –computer simulation.

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

Induction Machines: Voltage and toque equations–transformation for rotor circuits–voltage and toque equations in reference frame variables–analysis of steady state operation–free acceleration characteristics– dynamic performance for load and torque variations–dynamic performance for three phase fault–computer simulation in arbitrary reference frame.

Course Outcomes for First Year First Semester Course	
Course Code: M16 PS 1106	
Course Title: POWER SYSTEM MODELING	
CO-1	Model the synchronous and induction machine by using different reference frame theories
CO-2	Model the Transmission line, SVC and load
CO-3	Students will be able to understand power governing, dynamic frequency control of large systems, Impact of Renewable generation on Frequency control
CO-4	Students will be able to explain the Issues Regarding Renewable Energy System in PowerSystem
CO-5	Students will be able to outline the Power system economics and Electricity Market
CO-6	Students will have vision towards sustainable supply systems in Future.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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Estd: 1980

SYLLABUS: POWER SYSTEM PLANNING (M16 PS 1107)

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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 PS 1107	
Course Title: POWER SYSTEM PLANNING	
CO-1	Students will be able to perform load forecasting for better planning of system.
CO-2	Graduates are able to know the reliability of power system and do planning accordingly.
CO-3	Graduates can carry out overall energy planning by automation.

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SYLLABUS: POWER SYSTEM SIMULATION LAB-I (M16 PS 1108)

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
6. MATLAB Program to Find Optimum Loading of Generators Neglecting Transmission Losses.
7. MATLAB Program to Find Optimum Loading of Generators with Penalty factors.
8. MATLAB Program to Solve Swing Equation.
9. Simulink Model of Single Area Load Frequency Control with and without PI Controller in Simulink.
10. Simulink Model for Two Area Load Frequency Control
11. Simulink Model for Evaluating Transient Stability of Single Machines Connected to Infinite Bus

Course Outcomes for First Year First Semester Course	
Course Code: M16 PS 1108	
Course Title: POWER SYSTEM SIMULATION LAB-I	
CO-1	Graduate will demonstrate the ability to identify, formulate and solve Power Systemengineering problems.
CO-2	Graduate will demonstrate the ability to design and conduct experiments, analyse andinterpret data.
CO-3	Graduates will demonstrate the ability to design a electrical systems or process as per needsand specifications
CO-4	Graduate will demonstrate the skills to use modern engineering tools, softwares andequipment to analyse problem.

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Estd: 1980

SYLLABUS: POWER SYSTEM DYNAMICS & STABILITY (M16 PS 1201)

Modelling: Basic concepts, Review of classical methods, modelling of synchronous machine, Parks transformation, Analysis of steady state performance, Excitation system, excitation system modelling, Excitation systems-standard block diagram, System representation by state equations, Prime mover control system, Transmission lines, SVC and Loads modelling, D-Q transformation using α-β variables.

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 implified system model, detailed models, Case I and II, Inclusion of load and SVC dynamics, modal analysis of large power systems.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 PS 1201	
Course Title: POWER SYSTEM DYNAMICS & STABILITY	
CO-1	Will be able to solve the reactive power problems in power system
CO-2	Will learn the concepts of Dynamics, Stability, Excitation and SMIB of Power Systems.
CO-3	Will be able to do machine modeling.
CO-4	Will do modeling of Excitation systems and Transmission lines.
CO-5	Will be able to understand the effect of excitation system on small signal stability.
CO-6	Understand the significance of power system stabilizer in power system stabilities.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204. (AP)

Estd: 1980

SYLLABUS: AUTOMATION IN POWER SYSTEMS (M16 PS 1202)

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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 PS 1202	
Course Title: AUTOMATION IN POWER SYSTEMS	
CO-1	Learn various activities of central control room management.
CO-2	Understand about SCADA
CO-3	Gain the knowledge on application of automation to distribution system.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204. (AP)

Estd: 1980

SYLLABUS: INTELLIGENT SYSTEMS AND CONTROL (M16 PS 1203)

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.

ANN based control: Introduction: Representation and identification, modelling the plant, control structures–supervised control, Model reference control, Internal model control, Predictive control, Case study-application to electrical engineering.

Fuzzy Logic: Overview of classical logic, Fuzzy setsvs 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.

Fuzzy Controllers: Preliminaries–Basic architecture and operation of Fuzzy controller–Analysis of static properties of fuzzy controller–Analysis of dynamic properties of fuzzy controller– simulation studies–case studies –application to electrical engineering.

Neuro–Fuzzy Controllers: Neuro–fuzzy systems: A unified approximate reasoning approach– Construction of role bases by self-learning: System structure and learning algorithm–A hybrid neural network based Fuzzy controller with self-learning teacher. Fuzzified CMAC and RBF network based self-learning controllers, case studies –application to electrical engineering.

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Estd: 1980

SYLLABUS: OPTIMAL CONTROL THEORY (M16 PS 1204)

Introduction: Problem formulation-State variable representation of systems–Performance measures for optimal control problems– selecting a performance measure.

Dynamic programming: The optimal control law-principle of optimality and its application-optimal control system-interpolation-recurrence relation of dynamic programming-computational procedure for solving optimal control problems–characteristics of dynamic programming solution-analytical results-discrete linear regulator problems- Hamilton- Jacobi-Bellman equation-continuous linear regulator problems.

The Calculus of variations: Fundamental concepts-linearity of functional-closeness of functions-the increment of a functional-The variation of a functional-maxima and minima of functional-the fundamental theorem of the calculus of variations- Functional of a single function-the simplest variational problem

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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 PS 1204	
Course Title: OPTIMAL CONTROL THEORY	
CO-1	Have familiarity with problem formulation and different forms of performance measures asapplied to variety of optimal control problems.
CO-2	Apply optimal control law and dynamic programming computational procedure to solveoptimal control problems.
CO-3	Apply Hamilton-Jacobi-Bellman equations to solve linear regulator problem
CO-4	Have complete familiarity with Calculus of Variation.
CO-5	Have familiarity with Pontryagins minimum principle.
CO-6	Apply numerical techniques like steepest descent algorithm to determine optimal trajectories.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)
ChinnaAmiram, Bhimavaram-534204. (AP)
Estd: 1980

SYLLABUS: HIGH VOLTAGE AC/DC TRANSMISSION (M16 PS 1205)

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.

HVDC Transmission: General aspects of HVDC transmission, HVD Clinks-comparison– Economic, Technical performance–Reliability–Limitations-Properties of thyrist or converter circuits-assumptions-Choice of best circuit for HVDC converters-Transformer connections– Analysis with gate control but no overlap less than 60 degrees-operation of inverters.

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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 PS 1205	
Course Title: HIGH VOLTAGE AC/DC TRANSMISSION	
CO-1	To understand the basic concepts of EHV AC and HVDC transmission.
CO-2	To identify the electrical requirements for HVDC lines.
CO-3	To identify the components used in AC to DC conversion.
CO-4	To understand the operation of HVDC conversion technology.
CO-5	To understand the fundamental requirements of HVDC transmission line design.
CO-6	To identify factors affecting AC-DC transmission.
CO-7	To Design Filters for reduction of harmonics and Become familiarize with the use ofprotection equipment

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Estd: 1980

SYLLABUS: POWER QUALITY (M16 PS 1206)

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

Long Interruptions: Interruptions–Definition–Difference between failure, outage, Interruptions–causes of Long Interruptions–Origin of Interruptions–Limits for the Interruption frequency–Limits for the interruption duration–costs of Interruption–Overview of Reliability evaluation to power quality, comparison of observations and reliability evaluation.

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 phasefaults, 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 standard European voltage characteristics standards.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 PS 1206	
Course Title: POWER QUALITY	
CO-1	Students are able to possess the necessary skills to understand and handle power qualityrelated problems.
CO-2	Students are able to identifying the cause or source of the problem and assessing the severityof each problem with respect to the vulnerability of the affected devices.
CO-3	Students expected to be familiar with power quality terminologies, and ready to tackle powerquality related challenges.
CO-4	Students will be able to identify the standard characteristics and PQ survey.

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Estd: 1980

SYLLABUS: POWER ELECTRONIC APPLICATIONS IN POWER SYSTEMS (M16 PS 1207)

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-Analysis 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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 PS 1207	
Course Title: POWER ELECTRONIC APPLICATIONS IN POWER SYSTEMS	
CO-1	Understand the importance of FACTS controllers and its benefits.
CO-2	Know the objectives of shunt, series compensations and role of FACTS devices on systemstability, voltage control.
CO-3	Analyze the functional operation and control of SVC and STATCOM.
CO-4	Describe the principle, operation and control of SPST.

SYLLABUS: POWER SYSTEM SIMULATION LAB-II (M16 PS 1208)

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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 PS 1208	
Course Title: POWER SYSTEM SIMULATION LAB-II	
CO-1	The student will be able to validate the adaptability of economic load dispatch and load flowfor a given situation by simulation results.
CO-2	Design a controller for FACTS application by simulation
CO-3	Demonstrate the effects of different sequence reactance of a synchronous machine by experimentation.
CO-4	Acquainted with the characteristics of different relays by experimentation
CO-5	Know how to use the simulation software to design a real time power system.

INFORMATION TECHNOLOGY

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

INFORMATION TECHNOLOGY

SYLLABUS: MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (M16 CST 1101)

(Common to M.TECH (CST, IT))

UNIT-I : Mathematical notions of sets, sequences and tuples, functions and relations, Primitive recursive functions, computable functions, examples, graphs, strings and languages.

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

UNIT-III: 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.

UNIT-IV: 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.

UNIT-V: Context Free Languages: Context –Free Grammar – Regular Languages and Context-Free Grammar – Pushdown Automata – Pushdown Automata and Context-Free Grammar – Properties of Context-Free Languages – pushdown automata and Equivalence with Context Free Grammars.

UNIT-VI: 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

Course Outcomes for First Year First Semester Course	
Course Code: M16 CST 1101	
Course Title: MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	
CO-1	Critical, logical-mathematical reasoning
CO-2	Ability to apply mathematical knowledge and logic in solving problems.
CO-3	Understanding of formal grammar analysis and compilation.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: DATA STRUCTURES & ALGORITHMS (M16 CST 1102)

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

UNIT-II: 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.

UNIT-III: Trees: Implementation and traversal of trees, Binary Trees and Binary search trees in C++, Concepts of AVL Trees, Splay Trees and B-Trees.

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

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

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

UNIT-VII: Graph Algorithms: Representation of graph Topological Sort, shortest-path Algorithm, Network flow problem, Minimum spanning tree algorithm, Applications of Depth – First search, Introduction to NP-Completeness.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CST 1102	
Course Title: DATA STRUCTURES & ALGORITHMS	
CO-1	Be able to write programs and class libraries given a specification;
CO-2	Implement various data structures.
CO-3	Implement and analyze various sorting algorithms.
CO-4	Understand abstract data types and how they are implemented in “C“ programming language

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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Estd: 1980

SYLLABUS: ADVANCED DATA BASE MANAGEMENT SYSTEMS (M16 CST 1103)

UNIT-I: 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.

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

UNIT-III: 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.

UNIT-IV: Query Evaluation: Overview, Query processing, Query optimization, Performance Tuning.

UNIT-V: 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.

UNIT-VI: Transaction Management: Overview of Transaction Management, Transactions, and Concurrency control, Recovery systems, Advanced Transaction Processing.

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

Course Outcomes for First Year First Semester Course	
Course Code: M16 CST 1103	
Course Title: ADVANCED DATA BASE MANAGEMENT SYSTEMS	
CO-1	Understanding of DBMS.
CO-2	Design database using ER model and refine the design by enforcing functional dependencies, integrity constraints and normalization
CO-3	Write queries using SQL
CO-4	Implement procedures and triggers

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Estd: 1980

SYLLABUS: ADVANCED OPERATING SYSTEMS (M16 CST 1104)

UNIT-I: Introduction To Operating Systems, Types Of Operating Systems, Operating System Structures. Operating-System Services, System Calls, Virtual Machines, Operating System Design And Implementation.

UNIT-II: Process Management: Process Concepts, Operations On Processes, Cooperating Processes, Threads, Inter Process Communication, Process Scheduling, Scheduling Algorithms, Multiple -Processor Scheduling. Thread Scheduling.

UNIT-III: Process Synchronization & Deadlocks: The Critical Section Problem, Semaphores, And Classical Problems Of Synchronization, Critical Regions, Monitors, Deadlocks,-System Model, Deadlocks Characterization, Methods For Handling Deadlocks, Deadlock- Prevention, Avoidance, Detection,& Recovery from Deadlocks.

UNIT-IV: Memory Management & File System Implementation: Logical Versus Physical Address Space, Paging And Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Thrashing, File System Implementation -Access Methods, Directory Structure, Protection, File System Structure, Allocation Methods, Free Space Management, Directory Management, Device Drivers

UNIT-V: Distributed Operating Systems: Distributed System Goals, Types Of Distributed Systems, Styles & Architecture Of Distributed Systems, Threads, Virtualization, Clients, Servers, Code Migration, and Communication in Distributed Systems.

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

UNIT-VII: Fault Tolerance, Security: Introduction To Fault Tolerance, Process Resilience Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, Recovery, Secure Channels, Access Control, Security Management.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CST 1104	
Course Title: ADVANCED OPERATING SYSTEMS	
CO-1	Students understands the concept of Distributed systems, Process Synchronization, File structure and shared memory in Distributes operating systems

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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Estd: 1980

SYLLABUS: COMPUTER ORGANIZATION AND ARCHITECTURE (M16 IT 1101)

UNIT-I: 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.

UNIT-II: 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.

UNIT-III: Micro programmed Control:

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

UNIT-IV: Central Processing Unit:

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

UNIT-V: 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.

UNIT-VI: Memory Organization:

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

UNIT-VII: Overview of Computer Architecture:

Evolution of Computer Systems, Parallelism in Uni - Processor System, Parallel Computer Structures, Architectural Classification Schemes, Parallel Processing Applications.

Course Outcomes for First Year First Semester Course	
Course Code: M16 IT 1101	
Course Title: COMPUTER ORGANIZATION AND ARCHITECTURE	
CO-1	Students can understand the architecture of modern computer.
CO-2	They can analyze the Performance of a computer using performance equation
CO-3	Understanding of different instruction types.
CO-4	Students can calculate the effective address of an operand by addressing modes
CO-5	They can understand how computer stores positive and negative numbers.
CO-6	Understanding of how a computer performs arithmetic operation of positive and negative numbers.
CO-7	Understanding of how computer stores floating point numbers in IEEE 754 standard.
CO-8	Cache memory and its importance.
CO-9	Students can understand how cache mapping occurs in computer and can solve various problemsrelated to this.
CO-10	Secondary storage organization and problem solving

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Estd: 1980

SYLLABUS: E-COMMERCE (M16 IT 1102)

UNIT-I: Introduction: Electronic Commerce-Frame Work, Anatomy of E-Commerce Applications, E-Commerce Consumer Applications, E-Commerce Organization Applications. Consumer Oriented Electronic Commerce - Mercantile Process Models, Digital Economy and e- business Models

UNIT-II: 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.

UNIT-III: Intra Organizational Commerce, Macro Forces and Internal Commerce, Work Flow Automation and Coordination, Customization and Internal Commerce, Supply Chain Management. Business Cases for Document Library, Digital Document Types, Corporate Data Ware-Houses.

UNIT-IV: Advertising And Marketing: Information Based Marketing, Advertising On Internet, Online Marketing Process, Market Research. Consumer Search and Resource Discovery, Information Search and Retrieval, Commerce Catalogues, Information Filtering.

UNIT-V: Multimedia-Key Multimedia Concepts, Digital Video and Electronic Commerce, Desktop Video Processing, Desktop Video Conferencing.

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

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

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

Course Outcomes for First Year First Semester Course	
Course Code: M16 IT 1102	
Course Title: E-COMMERCE	
CO-1	Student able to understand advertising, marketing process on the internet and be familiar with the e-commerce services

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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Estd: 1980

SYLLABUS: EMBEDDED SYSTEMS (M16 IT 1103)

UNIT-I: Examples of Embedded Systems – Typical Hardware – Memory – Microprocessors – Busses – Direct Memory Access – Introduction to 8051 Microcontroller – Architecture- Instruction set – Programming.

UNIT-II: Microprocessor Architecture – Interrupt Basics – The Shared-Data problem – Interrupt Latency.

UNIT-III: Round–Robin Architecture - Round–Robin with Interrupts Architecture - Function-Queue-Scheduling Architecture – Real-Time Operating Systems Architecture – Selection of Architecture.

UNIT-IV: Tasks and Task States – Tasks and Data – Semaphores and Shared Data – Semaphore Problems – Semaphore variants.

UNIT-V: Message Queues – Mailboxes – Pipes – Timer Functions – Events – Memory Management – Interrupt Routines in RTOS Environment.

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

UNIT-VII: Host and Target Machines – Linker/Locator for Embedded Software- Getting Embedded Software into the Target System.

UNIT-VIII: Testing on your Host Machine – Instruction Set Simulators – Laboratory Tools used for Debugging.

Course Outcomes for First Year First Semester Course	
Course Code: M16 IT 1103	
Course Title: EMBEDDED SYSTEMS	
CO-1	An ability to design systems, components, or processes for broadly-defined engineering technology problems.
CO-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.
CO-3	Design, test and critically evaluate embedded solutions to real world situations using digital components (sequential and combinatorial).
CO-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.
CO-5	Develop software systems for embedded devices using assembler code

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: IMAGE PROCESSING (M16 IT 1104)

UNIT-I: Fundamentals of Image Processing: Image Acquisition, Image Model, Sampling, Quantization, and Relationship between Pixels, Distance Measures, Connectivity, Image Geometry, and Photographic Film. Histogram: Definition, Decision Of Contrast Basing On Histogram, Operations Basing on Histograms Like Image Stretching, Image Sliding, Image Classification. Definition and Algorithm of Histogram Equalization.

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

UNIT-III: 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.

UNIT-IV: Image Enhancement: Design of Low Pass, High Pass, EDGE Enhancement, Smoothening Filters in Frequency Domain. Butter Worth Filter, Homomorphic Filters in Frequency Domain Advantages of Filters in Frequency Domain, Comparative Study of Filters in Frequency, Domain and Spatial Domain.

UNIT-V: 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.

UNIT-VI: 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

UNIT-VII: 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

UNIT-VIII: 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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 IT 1104	
Course Title: IMAGE PROCESSING	
CO-1	Demonstrated understanding of the basic concepts of two-dimensional signal acquisition
CO-2	Demonstrated understanding of spatial filtering techniques
CO-3	Demonstrated understanding of 2D Fourier transform concepts
CO-4	Demonstrated understanding of the fundamental image enhancement algorithms such ashistogram modification

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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Estd: 1980

SYLLABUS: ARTIFICIAL INTELLIGENCE (M16 IT 1105)

UNIT-I: Introduction: Artificial Intelligence, AI Problems, AI Techniques, the Level of the Model, Criteria for Success. Defining the Problem as a State Space Search, Problem Characteristics, Production Systems, Search: Issues in The Design of Search Programs, Un-Informed Search, BFS, DFS; Heuristic Search Techniques: Generate-And- Test, Hill Climbing, Best-First Search, A* Algorithm, Problem Reduction, AO*Algorithm, Constraint Satisfaction, Means- Ends Analysis.

UNIT-II: Knowledge Representation: Procedural Vs Declarative Knowledge, Representations & Approaches to Knowledge Representation, Forward Vs Backward Reasoning, Matching Techniques, Partial Matching, Fuzzy Matching Algorithms and RETE Matching Algorithms; Logic Based Programming- AI Programming languages: Overview of LISP, Search Strategies in LISP, Pattern matching in LISP , An Expert system Shell in LISP, Over view ofProlog, Production System using Prolog

UNIT-III: Symbolic Logic: Propositional Logic, First Order Predicate Logic: Representing Instance and is-a Relationships, Computable Functions and Predicates, Syntax & Semantics of FOPL,Normal Forms, Unification &Resolution, Representation Using Rules, Natural Deduction; Structured Representations of Knowledge: Semantic Nets, Partitioned Semantic Nets, Frames, Conceptual Dependency, Conceptual Graphs, Scripts, CYC.

UNIT-IV: Reasoning under Uncertainty: Introduction to Non-Monotonic Reasoning, Truth Maintenance Systems, Logics for Non-Monotonic Reasoning, Model and Temporal Logics; Statistical Reasoning: Bayes Theorem, Certainty Factors and Rule-Based Systems, Bayesian Probabilistic Inference, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic: Crisp Sets ,Fuzzy Sets, Fuzzy Logic Control, Fuzzy Inferences & Fuzzy Systems.

UNIT-V: Experts Systems: Overview of an Expert System, Structure of an Expert Systems, Different Types of Expert Systems- Rule Based, Model Based, Case Based and Hybrid Expert Systems, Knowledge Acquisition and Validation Techniques, Black Board Architecture, Knowledge Building System Tools, Expert System Shells, Fuzzy Expert systems.

UNIT-VI: 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.

UNIT-VII: 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

Course Outcomes for First Year First Semester Course	
Course Code: M16 IT 1105	
Course Title: ARTIFICIAL INTELLIGENCE	
CO-1	Able to learn artificial intelligence techniques
CO-2	Understand the concept of machine learning.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: COMPILER DESIGN (M16 IT 1106)

UNIT-I: Introduction: Introduction to Compilers and Language processors, , Programming Language basics, Extended Backus- Naur Form Syntax Notation, Applications of Compiler Technology, Design of New Computer Architecture, Structure & Different Phases of a Compiler, Review of Compiler Structure, Structure of Optimizing Compilation.

UNIT-II: Finite Automata & Lexical Analysis: introduction to Lexical Analysis, Lexical Analyzers, Approaches to design Lexical Analyzers, Language for specifying lexical analyzers, Introduction to Finite automata, Regular Expressions & Languages, Recognition of Tokens, Transition Diagrams, Look ahead Operator, Implementation of lexical analyzers, Lexical Analyzer Generator LEX.

UNIT-III: Syntax Analysis: Syntactic Specification of Programming Languages, Context Free Grammars & Languages, Introduction to Parsers, Parser Generators, Yacc, Creating Yacc Lexical Analyzer with LEX, Basic Parsing Techniques: Shift Reduce Parsing, Operator Precedence Parsing, Top-down Parsing, Recursive Descent Parsing, Predictive Parsers, LR Parsers: SLR, LALR & Canonical LR parsing, Construction of Parse Tree, Error Recovery in Parsers.

UNIT-IV: Semantic Analysis: Semantic Actions, Syntax Directed Translations, Translation on the parse Tree, Implementation of Syntax Directed Translator, Intermediate Codes, Syntax Directed translation to Postfix code, Syntax Trees, Intermediate Code Generation, Three Addr5ess Code-Translation of Expressions, Type Checking& Type Conversions.

UNIT-V: Code Optimization: Principal sources of Code Optimization, Loop Optimization, BasicBlocks& Flow Graphs, DAG Representation of Basic Blocks, Applications of DAG, Local Optimization, Unreachable Code Elimination, Dead Code Elimination, Data Flow Analysis, Data Flow Equations & Computations, Peep-Hole Optimization. Machine Dependent Optimizations, Overview of Informal Compiler Algorithm Notation(ICAN), If Simplification, Loop Simplification, Loop Inversion, Branch Optimization and Prediction.

UNIT-VI: 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.

UNIT-VII: 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.

UNIT-VIII: 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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 IT 1106	
Course Title: COMPILER DESIGN	
CO-1	To acquire the knowledge of modern compiler & its features.
CO-2	To learn the new code optimization techniques to improve the performance of a program in terms of speed & space.
CO-3	To use the knowledge of patterns, tokens & regular expressions

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: COMPUTER NETWORKS S (M16 IT 1107)

UNIT-I: Introduction to Computer Networks: Introduction, Network Hardware, Network Software, Reference Models, Data Communication Services & Network Examples, Internet Based Applications.

UNIT-II: Data Communications: Transmission Media, Wireless Transmission, Multiplexing, Switching, Transmission in ISDN, **Broad** Band ISDN , ATM Networks.

UNIT-III: 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.

UNIT-IV: Design Issues in Networks: Routing Algorithms, Congestion Control Algorithms, Net work Layer in the Internet, IP Protocol, IP Address, Subnets, and Internetworking.

UNIT-V: Internet Transport Protocols: TRANSPORT Service, Elements of Transport Protocols, TCP and UDP Protocols, Quality of Service Model, Best Effort Model, Network Performance Issues.

UNIT-VI: Over View of DNS, SNMP, Electronic Mail, FTP, TFTP, BOOTP, HTTP Protocols, World Wide Web, Firewalls.

UNIT-VII: 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.

UNIT-VIII: Advanced Concepts in Networks: Over View of Cellular Networks, Adhoc Networks, Mobile Adhoc Networks, Sensor Networks, Virtual Private Networks .Delay Tolerant Networks DTN, Ipvs.

Course Outcomes for First Year First Semester Course	
Course Code: M16 IT 1107	
Course Title: COMPUTER NETWORKS	
CO-1	Independently understand basic computer network technology.
CO-2	Identify the different types of network topologies and protocols.
CO-3	Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
CO-4	Identify the different types of network devices and their functions within a network
CO-5	Familiarity with the basic protocols of computer networks, and how they can be used toassist in network design and implementation.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: CLOUD COMPUTING (M16 IT 1108)

UNIT-I: Cloud Computing Basics - Cloud Computing Overview, Applications, Intranets and the Cloud, First Movers in the Cloud. The Business Case for Going to the Cloud - Cloud Computing Services, Business Applications, Deleting Your Datacenter, Salesforce.com, Thomson Reuters.

UNIT-II: Organization and Cloud Computing - When You Can Use Cloud Computing, Benefits, Limitations, Security Concerns, Regulatory Issues, Cloud Computing with the Titans - Google, EMC, NetApp, Microsoft, Amazon, Salesforce.com, IBMPartnerships.

UNIT-III: Hardware and Infrastructure - Clients, Security, Network, Services. Accessing the Cloud - Platforms, Web Applications, Web APIs,Web Browsers. Cloud Storage - Overview, Cloud Storage Providers, Standards - Application, Client, Infrastructure, Service.

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

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

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

UNIT-VII: Migrating to the Cloud - Cloud Services for Individuals, Cloud Services Aimed at the Mid- Market, Enterprise-Class Cloud Offerings, Migration, Best Practices and the Future of Cloud Computing - Analyze Your Service, Best Practices, How Cloud Computing Might Evolve.

Course Outcomes for First Year First Semester Course	
Course Code: M16 IT 1108	
Course Title: CLOUD COMPUTING	
CO-1	Understanding the systems, protocols and mechanisms to support cloud computing
CO-2	Develop applications for cloud computing
CO-3	Understanding the hardware necessary for cloud computing
CO-4	Design and implement a novel cloud computing application

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: GRID COMPUTING (M16 IT 1109)

UNIT-I: Introduction: Introduction to Parallel, Distributed Computing, Cluster Computing and Grid Computing, Characterization of Grids, Organizations and their Roles, Grid Computing Road Maps.

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

UNIT-III: Grid Monitoring: Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems-GridICE - JAMM -MDS-Network Weather Service-R-GMA-Other Monitoring Systems- Ganglia and GridM

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

UNIT-V: Data Management And Grid Portals: Data Management, Categories and Origins of Structured Data, Data Management Challenges, Architectural Approaches, Collective Data Management Services, Federation Services, Grid Portals, First-Generation Grid Portals, Second Generation Grid Portals.

UNIT-VI: Semantic Grid and Autonomic Computing: Meta data and Ontology in the Semantic Web, Semantic Web services, Layered structure of the Semantic Grid, Semantic Grid activities, Autonomic Computing.

UNIT-VII: Grid Security and Resource Management: Grid Security, A Brief Security Primer, PKI- X509 Certificates, Grid Security, Scheduling and Resource Management, Scheduling Paradigms, Working principles of Scheduling, A Review of Condor, SGE, PBS and LSF- Grid Scheduling with QoS.

Course Outcomes for First Year First Semester Course	
Course Code: M16 IT 1109	
Course Title: GRID COMPUTING	
CO-1	To understand the genesis of grid computing
CO-2	To know the application of grid computing
CO-3	To learn the technology and tool kits for facilitating grid computing

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: COMPUTER GRAPHICS & VISUAL COMPUTING (M16 IT 1110)

UNIT-I: Introduction: Computer Graphics and their applications, Computer Aided Design- Computer Art, Entertainment, Education and Training, Graphical User Interfaces; Over view of Graphics systems: Video Display Devices, Raster Scan systems, random scan systems, Graphics monitors and workstations, Input devices, hard copy devices, GUI and Interactive Input Methods, Windows and Icons , Virtual Reality Environments, Graphics software

UNIT-II: Output primitives: Points and Lines, **,** Line and Curve Attributes-Color and Gray scale levels Line Drawing Algorithms, Loading the Frame buffer, Line function, Circle Generating Algorithms, Ellipse Generating Algorithms, Other Curves, Parallel Curve Algorithms, Curve Functions , Pixel Addressing, Area Fill Attributes, Filled Area Primitives, Filled Area Functions, Cell Array, Character Generation, Character Attributes, Bundled Attributes, Inquiry Functions , Antialiasing.

UNIT-III: 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 andSurfaces, B Spline Curves and Surfaces.

UNIT-IV: Two & Three Dimensional Transformations: Two Dimensional Transformations: Basic Transformations, Matrix Representations, Homogeneous Coordinates, Composite Transformations, Other Transformations, Transformations between Coordinate Systems, Affine Transformations -, Transformation Functions-, Raster methods for Transformation Three Dimensional Transformations: Translation-, Rotation, scaling, Other Transformations Composite Transformations , 3D Transformation Functions , Modeling and Coordinate Transformations.

UNIT-V: 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.

UNIT-VI: 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.

UNIT-VII: 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-onexperience with creating graphical user interfaces, and with implementing programs forsynthesizing and manipulating photographs.

UNIT-VIII: Visual Transformation & Projection: Graphics pipeline, perception and color models,camera models, transformations and projection, projections, lighting, shading, global illumination, texturing, sampling theorem, Fourier transforms, image representations, convolution, linear filtering, diffusion, nonlinear filtering, edge detection, optical flow, imageand video compression, Creation of Visual Effects Optical Flow Video Compression, Radon Transform Texture.

Course Outcomes for First Year First Semester Course	
Course Code: M16 IT 1110	
Course Title: COMPUTER GRAPHICS & VISUAL COMPUTING	
CO-1	Learn basic and fundamental computer graphics techniques
CO-2	Represent and implement images and objects using 3D representation.
CO-3	Design develop surface detection using various detection methods
CO-4	Choose various illumination models for provides effective standards of objects
CO-5	Design of develop effective computer animations
CO-6	Design of various projections

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: PARALLEL PROGRAMMING (M16 IT 1111)

UNIT-I: 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.

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

UNIT-III: 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.

UNIT-IV: Performance Analysis: Introduction, Execution Time, Speedup, Linear and Super linear Speedup, Efficacy and Efficiency, Amdahls Law and Amdahl Effect, Gustafson-Barsiss Law,Minsky's Conjecture, The Karp-Flatt Metric, The Iso-Efficiency Metric, Iso-Efficiency Relation, Cost and Scalability.

UNIT-V: Parallel Computational Models: Flynns Taxonomy, PRAM, EREW, CREW, ERCW,CRCW, Simulating CRCW, CREW and EREW, PRAM Algorithms.

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

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

Course Outcomes for First Year First Semester Course	
Course Code: M16 IT 1111	
Course Title: PARALLEL PROGRAMMING	
CO-1	Recall fundamental concepts of parallelism
CO-2	Design and analyze the parallel algorithms for real world problems and implement themon available parallel computer systems.
CO-3	Reconstruction of emerging parallel algorithms with MPI. Compute contemporary parallel algorithms.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: COMPUTER VISION (M16 IT 1112)

UNIT-I: Fundamentals of Image Processing: Image Acquisition, Definitions of Pixel, Gray Value, Sampling, Quantization, Histogram, Image Sliding, Image Stretching. Distance and Connectivity. Image Smoothening Operations - Mean, Median, Mode Filters. Edge Enhancement Filters - Directional Filters, Laplacian, Sobel, Robert. Definition of Image Compression - Run Length Encoding Method, Contour Encoding Method. Definition of Segmentation - Pixel based method of segmentation.

UNIT-II: Morphological Operations: Definition of Thresholding, A few techniques of thresholding. Importance of Binary Images. Erosion, Dilation, Opening, Closing, HIT -or -MISS Transformation, Thinning, Thickening, Skeletons, Pruning, Con vex hull. Extensions to Gray - Scale Images. Applications of Gray - Scale Morphology. Applications of Morphological Operations in Pattern Analysis.

UNIT-III: 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.

UNIT-IV: Shape Representation and Descriptions (Part - 2): Region - Based Methods - Area - Algorithms for Calculation of Area. Euler‟s Number, Projections, Eccentricity, Elongatedness, Rectangularity, Direction, Compactness. Detailed Discussion on - Moments. Convex hull, Algorithms related to Convex hull. Graph Representation - Algorithm for Skeleton, Algorithm for Graph Construction. Definitions of Region Decomposition, Region Neighborhood Graphs, Shape Classes.

UNIT-V: Object Recognition: Knowledge Representation, Statistical Pattern Recognition, - Classification Principles, Classifier Setting, Classifier Learning. Syntactic Pattern Recognition - Grammars, and Languages, Syntactic Analysis, Syntactic Classifier. Recognition as Graph Matching - Isomorphism, Related Algorithms. Similarity of Graphs.

UNIT-VI: Artificial Neural Networks and Fuzzy Logic in Pattern Analysis: Introduction to ANN,Architecture of ANN, Activation Functions, Training of ANN - Supervised, Unsupervised, Reinforced, McCulloch - Pitts Model, HEBBNET, ADELINE ,Application of ANN in Pattern Analysis. Definition and Brief Discussion about Fuzzy Logic, Fuzzy Sets. Application in Pattern Analysis.

Course Outcomes for First Year First Semester Course	
Course Code: M16 IT 1112	
Course Title: COMPUTER VISION	
CO-1	Students demonstrate a thorough understanding of fundamental concepts in computervision
CO-2	Students must be able to design and conduct experimental validation for a computationalapproach to a computer vision problem, and interpret the results to assess the performance
CO-3	Students are familiar with methods used in various vision-based applications – imagefeature detection, 3-D reconstruction, segmentation.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: DATA STRUCTURES& PROGRAMMING LAB (M16 CST 1113)

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 sorting's on a given list

i. Bubble sort (ii) Insertion sort (iii) Selection sort(iv) Merge sort

5. To perform different types of sorting's 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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CST 1113	
Course Title: DATA STRUCTURES& PROGRAMMING LAB	
CO-1	Linear data structures
CO-2	Non-linear data structures
CO-3	Sorting and searching techniques

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: DATA BASE MANAGEMENT SYSTEMS LAB (M16 CST 1114)

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 Windowsplatform and MySQL/ PostgreSQL on Linux platform.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CST 1114	
Course Title: DATA BASE MANAGEMENT SYSTEMS LAB	
CO-1	Create Small applications using databases, Retrieve information from databases by usingqueries
CO-2	Implement procedures and triggers

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: WEB SYSTEMS &TECHNOLOGIES (M16 IT 1201)

UNIT-I: 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

UNIT-II: 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.

UNIT-III: Introduction to PHP Programming: Introduction, Database Access with PHP, PHP Interpreters, Security Issues, File Handling with PHP, Working with HTML and DHTML, PHP User Authentication.

UNIT-IV: 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.

UNIT-V: Multimedia: Audio and Video Speech, Synthesis and Recognition, E-Business Models, Online Payments and Security, Web Servers, Client and Server side Scripting, Accessing Web servers, Apache Web Server.

UNIT-VI: Database, ASP and XML: RDBMS Models, Overview of SQL, , ASP-Working of ASP, objects, Session Tracking and Cookies, ADO, Accessing Data Base with ASP, Serverside Active, X Components, Web resources, XML- Document type definition, XML Schemas, Document Object model, Presenting XML, Using XML Processors: DOM and SAX, Syntax of AJAX, Application Development using XML and AJAX.

UNIT-VII: Servlets and JSP: Introduction to Servelets: Servlet Overview Architecture, HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues, Multitier architecture, JSP Overview, , JSP Processing. JSP Application Design with MVC Setting Up and JSP Environment.

UNIT-VIII: 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

Course Outcomes for First Year Second Semester Course	
Course Code: M16 IT 1201	
Course Title: WEB SYSTEMS &TECHNOLOGIES	
CO-1	Student knows about the advanced Java and design applications using Database Design Applications and web pages for personal, Educational and business purposes.
CO-2	Develop mobile computing applications based on the paradigm of context aware computing and wearable computing

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: OBJECT ORIENTED SOFTWARE ENGINEERING (M16 CST 1202)

UNIT-I: Introduction to Object Oriented Software Engineering: Nature Of The Software, Types Of Software , Software Engineering Projects, Software Engineering Activities, Software Quality,Introduction To Object Orientation, Concepts Of Data Abstraction, Inheritance & Polymorphism, Software Process Models-Waterfall Model, The Opportunistic Model , The Phased Released Model, The Spiral Model, Evolutionary Model, The Concurrent Engineering Model

UNIT-II: 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.

UNIT-III: Unified Modeling Language & Use Case Modeling: Introduction To UML, Modeling Concepts, Types Of UML Diagrams With Examples; User-Centred Design, Characteristics Of Users, Developing Use Case Models Of Systems, Use Case Diagram, Use Case Descriptions, The Basics Of User Interface Design, Usability Principles, User Interfaces.

UNIT-IV: Class Design and Class Diagrams: Essentials Of UML Class Diagrams, Associations And Multiplicity, Other Relationships, Generalization, Instance Diagrams, Advanced Features Of Class Diagrams, Interaction And Behavioral Diagrams: Interaction Diagrams, State Diagrams, Activity Diagrams, Component And Deployment Diagrams.

UNIT-V: Software Design And Architecture: The Process Of Design, Principles Leading To Good Design, Techniques For Making Good Design Decisions, Writing A Good Design Document., Pattern Introduction, Design Patterns: The Abstraction-Occurrence Pattern, General Hierarchical Pattern, The Play-Role Pattern, The Singleton Pattern, The Observer Pattern, The Delegation Pattern, The Adaptor Pattern, The Façade Pattern, The Immutable Pattern, The Read-Only Interface Pattern And The Proxy Pattern; Software Architecture Contents Of An Architecture Model, Architectural Patterns: The Multilayer, Client-Server, Broker, Transaction Processing, Pipe & Filter And MVC Architectural Patterns.

UNIT-VI: Software Testing: Overview Of Testing, Testing Concepts, Testing Activities, Testing Strategies, Unit Testing, Integration Testing, Function Testing, Structural Testing, Class Based Testing Strategies, Use Case/Scenario Based Testing, Regression Testing, Performance Testing, System Testing, Acceptance Testing, Installation Testing, OO Test Design Issues, Test Case Design, Quality Assurance, Root Cause Analysis, Post-Mortem Analysis.

UNIT-VII: Software Project Management: Introduction To Software Project Management, ActivitiesOf Software Project Management, Structure Of Project Plan, Software Engineering Teams, Software Cost Estimation, Project Scheduling, Tracking And Monitoring.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CST 1202	
Course Title: OBJECT ORIENTED SOFTWARE ENGINEERING	
CO-1	Student Knows about the techniques of planning and monitoring the progress of asoftware project.
CO-2	Project management and cost estimation techniques
CO-3	Be familiar with software development team architectures

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: INFORMATION SECURITY AND CRYPTOGRAPHY (M16 IT 1202)

UNIT-I: 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.

UNIT-II: Network Security: A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, Introduction to TCP/IP TCP , fire walls, session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks, Virtual Private Networks, Brief Study on Cryptography and Security

UNIT-III: User Authentication Mechanisms: Introduction, Authentication Basics, Passwords authentication tokens, Certificate based authentications, Biometrics based authentication, Kerberos, X.509 Directory Authentication Service, SSO Approaches

UNIT-IV: Public Key Infrastructure: Public key cryptography principles and algorithms, digital signatures, digital Certificates, Certificate Authority and key management, Public Key Cryptography Standards, Private Key Management, The PRIX Model, XML,PKI and Security

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

UNIT-VI: 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.

UNIT-VII: IP Security and Fire walls: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management, Firewall Design principles, Trusted Systems, Intrusion Detection Systems.

UNIT-VIII: 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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 IT 1202	
Course Title: INFORMATION SECURITY AND CRYPTOGRAPHY	
CO-1	Identify and prioritize information assets, threats
CO-2	Define an information security strategy and architecture.
CO-3	Plan for and respond to intruders in an information system and plan for recovery of information assets after an incident

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ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: WIRELESS & MOBILE NETWORKS (M16 IT 1203)

UNIT-I: 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

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

UNIT-III: Wireless Adhoc Networks: Basics of Wireless Networks, Infrastructured Versus Infrastructure less Networks – Properties of Wireless, AD hoc Networks, Types of Ad Hoc Networks, Challenges in AD Hoc Networks –Applications of Wireless AD Hoc Networks

UNIT-IV: Routing Protcols for Ad Hoc Networks: Introduction-Proactive Routing Protocols- Reactive Routing protocols-Hybrid Routing Protocols-QoS Metrics-Energy impact issues in Routing.

UNIT-V: Other Wireless Technologies: Introduction, IEEE 802.15.4 and Zigbee, General Architecture, Physical Layer, MAC layer, Zigbee, WiMAX and IEEE 802.16, Layers and Architecture, Physical Layer, OFDM Physical layer.

UNIT-VI: Mobile Communications: Introduction to cellular concept, Frequency Reuse, Handoff, GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services, Introduction to mobile computing, novel applications, limitations, and architecture.

UNIT-VII: 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.

UNIT-VIII: Security in Ad Hoc Networks: Introduction- Security Attacks, Intrusion Detection System, Intrusion Prevention system, Intrusion Response system, Wired Equivalent Privacy(WEP) - A Security Protocol for Wireless Local Area Networks (WLANs), Security in MANETs.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 IT 1203	
Course Title: WIRELESS & MOBILE NETWORKS	
CO-1	Know various mobile wireless network
CO-2	Know different Adhoc networks
CO-3	Know about mobile data network
CO-4	Work out security measures in Adhoc

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Estd: 1980

SYLLABUS: MATHEMATICS OF INTERNET SYSTEMS & CONTROL (M16 IT 1204)

UNIT-I: 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

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

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

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

UNIT-V: 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

UNIT-VI: 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

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

UNIT-VIII: Real-time Sources and Distributed Control: Probing & Distributed Admission Control, Queuing Model at Link Buffer, Diffusion Approximation-Brownian Motion Through a Queue.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 IT 1204	
Course Title: MATHEMATICS OF INTERNET SYSTEMS & CONTROL	
CO-1	Able to know web basics and algorithms
CO-2	Able to understand structure of internet search engine
CO-3	Able to know real-time sources
CO-4	Able to compute real time search engine

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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Estd: 1980

SYLLABUS: IT INFRASTRUCTURE PLANNING AND MANAGEMENT (M16 IT 1205)

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

UNIT-II: Design Issues: Design Issues of IT organizations and IT Infrastructure, Determing Customer Requirements, IT system Management Process, IT Services Management Process, Information System Design Process, Patterns for IT Systems Managements, IT infrastructure Library

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

UNIT-IV: 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

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

UNIT-VI: Desktop Scenarios: Windows Optimized Desktop Scenarios, Communication &Collaboration Exchange Server, SharePoint Server

UNIT-VII: Security: Computer Security, Internet Security, Physical Security, Malware Response, Forefront Identity Manager, Forefront Unified Access Gateway, Selecting the Right NAP Architecture

UNIT-VIII: 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

Course Outcomes for First Year Second Semester Course	
Course Code: M16 IT 1205	
Course Title: IT INFRASTRUCTURE PLANNING AND MANAGEMENT	
CO-1	Able to find out primary issues of a project.
CO-2	Able to find out different operations in a project.
CO-3	Able to handle a project without any problems.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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Estd: 1980

SYLLABUS: GEO INFORMATICS (M16 IT 1206)

UNIT-I: 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

UNIT-II: 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

UNIT-III: 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

UNIT-IV: 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

UNIT-V: Remote Sensing and GIS Integration: Principles of Electromagnetic Remote Sensing System Classifications-Imaging Characteristics of Remote Sensing Systems-Extraction of Metric Information from Remotely Sensed Images-Extraction of Thematic Information from Remotely Sensed Images- Integration of Remote Sensing and GIS

UNIT-VI: 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.

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

UNIT-VIII: GIS Implementation and Project Management: Software Engineering as Applied to GIS- GIS Project Planning-Systems Analysis and User Requirements-Geographic Database Design Methodology-GIS Application Software Design Methodology-Systems Implementation and Technology Rollout-Systems Maintenance and Technical Support, GIS Issues and Prospects: Issues of Implementing GIS-The Trend of GIS-Development Frontiers of GIS Research.

Course Outcomes for First Year First Second Semester Course	
Course Code: M16 IT 1206	
Course Title: GEO INFORMATICS	
CO-1	Graduates will demonstrate the ability to model and development of application inGeospatial arena interpret and analyze data, and report results.
CO-2	Graduates will demonstrate the ability to develop Geospatial system that meets desired specifications and requirements
CO-3	Graduates will demonstrate an understanding of their professional and ethical responsibilities.

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ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: DATABASE SECURITY (M16 IT 1207)

UNIT-I: Introduction To Database Security: Fundamental Data Security Requirements, Data Security Concerns, Compliance Mandates, Security Risks, Developing Enterprise Security Policy, Defining a Security Policy, Implementing a Security Policy, Techniques to Enforce Security

UNIT-II: Database Access Control: User Authentication, Protecting Passwords, Creating Fixed Database Links, Encrypting Database Link Passwords, Using Database Links Without Credentials, Using Database Links And Changing Passwords, Auditing With Database Links, Restricting A Database Link With Views, Trust Management & Negotiation

UNIT-III: Database Security Issues: Database Security Basics, Security Checklist, Reducing Administrative Effort, Applying Security Patches, Default Security Settings, Secure Password Support, Enforcing Password Management, Protecting The Data Dictionary, System and Object Privileges, Secure Data Outsourcing, Security in Advanced Database Systems, Security in Data Warehousing and OLAP Systems, Managing Enterprise User Security

UNIT-IV: Framework For Database Security: Security for Workflow Systems, Secure Semantic Web Services, Spatial Database Security, Security Reengineering, Strong Authentication, Single Sign-On, Public Key Infrastructure (PKI) Tools, Configuring SSL on the Server, Certificates, Using Kerberos for Authentication

UNIT-V: 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

UNIT-VI: 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.

UNIT-VII: 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

UNIT-VIII: 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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 IT 1207	
Course Title: DATABASE SECURITY	
CO-1	Able to understand the database security framework
CO-2	Will be able to learn database access control
CO-3	Will be able to understand database security techniques.
CO-4	Will be able to implement security for databases.

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ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: BUSINESS INTELLIGENCE (M16 IT 1208)

UNIT-I: 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

UNIT-II: 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

UNIT-III: AI Techniques & Programming: Logic Based Programming- AI Programming languages: Overview of LISP & Prolog, Search Strategies in LISP, Production System using Prolog, Fuzzy Logic: Crisp Sets, Fuzzy Sets, Fuzzy Logic Control, Fuzzy Inferences & Fuzzy Systems. Matching Techniques, Partial Matching, Fuzzy Matching Algorithms and RETE Matching Algorithms; Pattern matching in LISP.

UNIT-IV: Overview Of Business Intelligence: Managerial, Strategic And Technical Issues Associated With BI, Database Systems And Database Integration, Data Warehousing, Data Marts. Query and Report Generation Technologies, Business Process Modeling & Analysis, Planning: Components of a Planning System, Goal Stack Planning, Hierarchical Planning, Reactive Systems

UNIT-V: Business Analytics For BI: Data Ware House Architecture: OLAP, Data Cubes, Reporting Tools, Balance Score card, 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.

UNIT-VI: Experts Systems : Overview of an Expert System, Structure of an Expert Systems, DifferentTypes of Expert Systems- Rule Based, Model Based, Case Based and Hybrid Expert Systems, Concepts and Practice of DSS Modeling, Knowledge Acquisition and Validation Techniques, Black Board Architecture, Knowledge Building System Tools, Expert System Shells, Expert system Shell in LISP, Fuzzy Expert systems

UNIT-VII: 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.

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

Course Outcomes for First Year Second Semester Course	
Course Code: M16 IT 1208	
Course Title: BUSINESS INTELLIGENCE	
CO-1	Understand different types of AI agents
CO-2	Know various AI search algorithms (uninformed, informed, heuristic, constraintsatisfaction, genetic algorithms)
CO-3	Understand the fundamentals of knowledge representation (logic-based, frame-based,semantic nets), inference and theorem proving
CO-4	Ability to apply knowledge representation, reasoning, and machine learning techniques toreal-world problems

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ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: BIG DATA ANALYTICS (M16 IT 1209)

UNIT-I: 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

UNIT-II: 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

UNIT-III: 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

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

UNIT-V: Map-Reduce and the New Software Stack: Distributed File Systems .Physical Organization of Compute Nodes, Large-Scale File-System Organization, Map-Reduce features: Map Tasks, Grouping by Key, Reduce Tasks, Combiners, Map-Reduce Execution, Coping With Node Failures, Algorithms Using Map-Reduce for Matrix multiplication, Relational Algebra operations, Workflow Systems, Recursive Extensions to Map-Reduce

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

UNIT-VII: Mining Data Streams: Stream Data Mode l 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

UNIT-VIII: 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

Course Outcomes for First Year Second Semester Course	
Course Code: M16 IT 1209	
Course Title: BIG DATA ANALYTICS	
CO-1	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
CO-2	Be able to analyze the various technologies & tools associated with Big Data.
CO-3	Be able to identify the challenges in Big Data with respect to IT Industry and pursuequality research in this field with social relevance

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: MOBILE COMPUTING (M16 IT 1210)

UNIT-I: Introduction to Mobile Computing: Overview of Mobile Technologies, Limitations, The Ubiquitous Network, Architecture for Mobile Computing, Three-Tier Architecture, Design Considerations for Mobile Computing, Mobile Computing Through Internet, Mobile Devises and Mobile-Enabled Applications.

UNIT-II: Introduction To Wireless Networking: Various Generations of Wireless Networks, Wireless LANs, Advantages and Disadvantages of WLANs, Fixed Network Transmission Hierarchy, Differences in Wireless and Fixed Telephone Networks, Traffic Routing in Wireless Networks, WAN Link Connection Technologies, Cellular Networks.

UNIT-III: 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.

UNIT-IV: Emerging Technologies: Introduction - Bluetooth - Radio Frequency Identification (RFID), WIMAX - Mobile IP - Ipv6 - Java Card, TCP/IP in the Mobile Setting, GSM and GPS

UNIT-V: Data Management Issues: Data Replication For Mobile Computers, Adaptive Clustering for Mobile Wireless Networks, File System, Disconnected Operations, Data Services in GPRS - Applications for GPRS - Limitations - Billing and Charging.

UNIT-VI: 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.

UNIT-VII: Introduction to Mobile IP: Introduction To Wireless Application Protocol, Application Layer MMS - GPRS Applications, Short Message Service (SMS): Mobile Computing Over SMS - SMS - Value Added Services Through SMS -Accessing the SMS Bearer.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 IT 1210	
Course Title: MOBILE COMPUTING	
CO-1	A working understanding of the characteristics and limitations of mobile hardware devices including their user
CO-2	The ability to develop applications that are mobile
CO-3	A comprehension and appreciation of the design and development of context

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: SOFT COMPUTING (M16 IT 1211)

UNIT-I: Soft Computing: Introduction to Fuzzy Computing, Neural Computing, Genetic Algorithms,Associative Memory, Adaptive Resonance Theory, Different Tools and Techniques, Usefulness and Applications.

UNIT-II: 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.

UNIT-III: 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.

UNIT-IV: 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

UNIT-V: 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.

UNIT-VI: Evolutionary and Stochastic Techniques: Genetic Algorithm (GA), Genetic Representations, (Encoding) Initialization and Selection, Different Operators of GA, Analysisof Selection Operations, Hypothesis of Building Blocks, Schema Theorem and Convergence of Genetic Algorithm, Simulated Annealing and Stochastic Models, Boltzmann Machine, Applications.

UNIT-VII: Rough Set: Introduction, Imprecise Categories Approximations and Rough Sets, Reduction of Knowledge, Decision Tables and Applications.

UNIT-VIII: 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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 IT 1211	
Course Title: SOFT COMPUTING	
CO-1	Able to understand genetic algorithm fundamentals and its operators and procedure
CO-2	Understand artificial neural network model and its activation functions
CO-3	Understand different operations of GA

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: CLUSTER COMPUTING (M16 IT 1212)

UNIT-I: Introduction: Overview of Cluster Computing, The Role of Clusters, Definition and Taxonomy Of Parallel Computing, Hardware System Structure, Node Software, Resource Management, Distributed Programming, Limitations

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

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

UNIT-III: Network Software: TCP/IP, Sockets, Higher Level Protocols, Distributed File systems,Remote Command Execution

UNIT-IV: Cluster Setup: Installation & Configuration, System Access Models, Assigning Names, Installation of Node Software, Basic System Administration

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

UNIT-VI: Virtualization technologies: Parallel and Virtual file systems, Introduction, Programming with parallel File systems, Benchmarks

Course Outcomes for First Year Second Semester Course	
Course Code: M16 IT 1212	
Course Title: CLUSTER COMPUTING	
CO-1	Have knowledge of virtual technologies and Service-oriented architecture
CO-2	Have knowledge of Architecture for Cluster Computing

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: PERVASIVE COMPUTING (M16 IT 1213)

UNIT-I: Pervasive Computing: Introduction to Ubiquitous Computing (Popularly known as Pervasive Computing), Evolution of Pervasive Computing, Pervasive Computing Principles: Decentralization, Diversification, Connectivity, Simplicity, Pervasive Computing Characteristics, Pervasive Information Technology

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

UNIT-III: 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

UNIT-IV: Pervasive Connectivity: Protocols, Security, Network Management, And Mobile Internet, WAN:Cellular Basics, Major Digital Cellular Systems, Advanced Cellular Radio Standards, Short Range Wireless Communication: DECT, Bluetooth, Irda, Home Networks.

UNIT-V: Pervasive Applications: Home Services: System View, Communications, Home Automation, Energy and Security Services, Remote Home Health Care Services, Business Services, Healthcare Management, Consumer Services: Interactive Advertisement, Loyalty, Shopping, Payment Services

UNIT-VI: 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

UNIT-VII: Security Issues in Pervasive Computing: Importance of Security, Cryptographic Patterns And Methods - Light Weight Cryptography -Light Weight Symmetric and AsymmetricCryptographic Algorithms, Cryptographic Tools - Hash, MAC, Digital Signatures

UNIT-VIII: Mobile Internet and Web Services: WAP Architecture, Wireless Application Environment: Wireless Markup Language, WAP Binary XML Content Format, WML Script, XHTML Mobile Profile, I-Mode, Web Services Architecture: WSDL, ADDI, SOAP, Web Services Security, Web Services For Remote Portals

Course Outcomes for First Year Second Semester Course	
Course Code: M16 IT 1213	
Course Title: PERVASIVE COMPUTING	
CO-1	Identify distinguishing features of the different mobile device categories,
CO-2	Understand the role of the Wireless Application Protocol in enabling mobile devices toaccess the Internet
CO-3	Understand elementary to medium-level (complexity-wise) user interface applications forall three platforms.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: SEMANTIC WEB (M16 IT 1214)

UNIT-I: Introduction to Semantic Web: Introduction, Semantic Web, URI, RDF, Ontologies, Inferences, DAML, Semantic Web Languages, Semantic Annotation, Classification, Information Extraction, Ontology Assignment, XML, Syntax of XML,XML Schema, Semantic Web Applications to E-Commerce, E-Government and E-Banking, Semantic Web in Life Sciences, RIF Applications.

UNIT-II: Semantic Web Structure: Semantic Web Layers Architecture, Different Layers, Match Making, Multi Information Retrieving, Digital Signature, Semantic Memory, Semantic Web Enabled Service Oriented Architecture (SESA), SESA Services, SESA Middle Ware.

UNIT-III: 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

UNIT-IV: Web Ontology Languages: OWL Syntax, OWL Species, OWL2 Standards, OWL Formal Semantics, Description Logics, Model Theoretic Semantics of OWL, SWRL, Semantic Web Rules, Languages, Syntax of SWRL, Rules and Safety, Implementation & Applications.

UNIT-V: Ontology Engineering: Requirement Analysis, Ontology Knowledge Creation, Ontologies and Rules: Definition of a Rule, Data log as First order Rule Language, Combining Rules with OWDL, Rule Interchanging Formats RIF, Quality Assurance of Ontologies, Modular Ontologies, Divide and Conquer, Software Tools.

UNIT-VI: 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 OWLDL.

UNIT-VII: 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

UNIT-VIII: Semantic Web Tools & Applications: Web Data Exchange and Syndication, Semantic WIKIs, 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

Course Outcomes for First Year Second Semester Course	
Course Code: M16 IT 1214	
Course Title: SEMANTIC WEB	
CO-1	Able to understand the rationale behind Semantic web.
CO-2	Understand the concept structure of the semantic web technology and how thistechnology revolutionizes the World Wide Web and its uses.
CO-3	Able to model and query domain knowledge as ontologies defined using standards suchas RDF and OWL.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: DATA WAREHOUSING & DATA MINING (M16 IT 1215)

UNIT-I: Introduction to Data Mining: Evolution of I T into DBMS, Motivation and importanceof 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

UNIT-II: 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.

UNIT-III: 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.

UNIT-IV: 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.

UNIT-V: 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

UNIT-VI: 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

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

Course Outcomes for First Year Second Semester Course	
Course Code: M16 IT 1215	
Course Title: DATA WAREHOUSING & DATA MINING	
CO-1	Extract knowledge using data mining techniques
CO-2	At the closing stage of the course, students will be able to analyze different operationsand techniques involved in data mining.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: NETWORK PROGRAMMING & WEB PROGRAMMING LAB (M16 IT 1216)

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 (Broad cast): 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**.**

Course Outcomes for First Year Second Semester Course	
Course Code: M16 IT 1216	
Course Title: NETWORK PROGRAMMING & WEB PROGRAMMING LAB	
CO-1	Student able to design Mail Clients, HTTP server. And also data from remote systems.
CO-2	Students design web pages using html tags.
CO-3	Identify user and content goals of the proposed web site and create functional and formaldesign specifications for a site.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

Estd: 1980

SYLLABUS: OBJECT ORIENTED SOFTWARE ENGINEERING LAB (M16 CST 1214)

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/fourstudents 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

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CST 1214	
Course Title: OBJECT ORIENTED SOFTWARE ENGINEERING LAB	
CO-1	Students can design and implement complex software solutions and test and document software.
CO-2	They are capable of working as part of a software team and develop significant projects

MECHANICAL ENGINEERING

SYLLABUS: COMPUTER GRAPHICS (M16CAD 1101)

Geometry and line generation: Line segments, Pixels and frame buffers, Brenham's algorithms: line, circle, ellipse generation.

Graphics primitives: Primitive operations, The display-file interpreter, Display-file structure, Display-file algorithms.

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.

Hidden surfaces and lines: Back-face removal, Back -face algorithms, The Painter's algorithm, Warnock's algorithm, Franklin algorithm, Hidden-line methods.

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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CAD 1101	
Course Title: COMPUTER GRAPHICS	
CO-1	Understand the contemporary graphics hardware and terminology.
CO-2	Implement graphics primitives, geometrical transformations, and visibility detection.
CO-3	Design and implement an application which illustrates the use of output primitives and 3D viewing model.
CO-4	Implement a method for the computer representation of objects.

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Estd: 1980

SYLLABUS: INTEGRATED COMPUTER AIDED DESIGN (M16 CAD 1102)

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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CAD1102	
Course Title: INTEGRATED COMPUTER AIDED DESIGN	
CO-1	Understand geometric transformation techniques in CAD.
CO-2	Develop mathematical models to represent lines, curves and surfaces used for engineering applications.
CO-3	Model engineering components using solid modelling techniques.
CO-4	Design and analysis of engineering components.

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Estd: 1980

SYLLABUS: COMPUTER NUMERICAL CONTROL TECHNOLOGY (M16 CAD 1103)

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 centers.

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.

Manual part programming: Part program instruction formats, Information codes: Preparatory function, Miscellaneous functions, Tool code and tool length offset, Interpolations, Canned cycles. Manual part programming for milling operations, Turning operations, Parametric subroutines.

Computer aided part programming: NC languages: APT, NELAPT, EXAPT, GNC, VNC, Pre-processor, Post processor.

APT programming: APT language structure, APT geometry: Definition of point, time, vector, circle, plane, patterns and matrices. APT motion commands: setup commands, point-to-point motion commands, continuous path motion commands. Post processor commands, complication control commands. Macro subroutines. Part programming preparation for typical examples.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CAD 1103	
Course Title: COMPUTER NUMERICAL CONTROL TECHNOLOGY	
CO-1	Understand the principles of Numerical Control (NC) technology and describe the range of machine tools to which it is applied.
CO-2	Outline the various routs for part programming in NC and CNC.
CO-3	Explain the application of CNC for Machining & Turning Centers.

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Estd: 1980

SYLLABUS: ROBOTICS (M16 CAD 1104)

Introduction: Basic concepts-Robot anatomy-robot configurations-Basic Robot motions-Types of drives-Applications-Material Handling-Processing-Assembly and Inspection -Safety considerations

Transformations and Kinematics: Vector operations-Translational transformations and Rotational transformations-Properties of transformation matrices-Homogeneous transformations and Manipulator-Forward solution-Inverse solution.

Controls and End Effectors: Control system concepts-Analysis-control of joints-Adaptive and optimal control-End effectors-Classification- Mechanical-Magnetic-Vacuum-Adhesive-Drive systems-Force analysis and Gripper design.

Robot Programming Methods: Languages-Computer control and Robot Software-VAL system and Language.

Sensory Devices: Non optical and optical position sensors-Velocity and Acceleration-Range- Proximity touch-Slip-Force-Torque- Machine vision-Image components-Representation - Hardware Picture coding-Object recognition and categorization-Software consideration

Course Outcomes for First Year First Semester Course	
Course Code: M16 CAD 1104	
Course Title: ROBOTICS	
CO-1	Distinguish between fixed automation and programmable automation
CO-2	Identify various components of robot.
CO-3	Select appropriate type of actuator for a joint.
CO-4	Illustrate robot applications in manufacturing.
CO-5	Analyze kinematics of a robot.
CO-6	Derive equations of motion of a manipulator for a particular application.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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Estd: 1980

SYLLABUS: ADVANCED OPTIMIZATION TECHNIQUES (M16 CAD 1105)

Introduction: Statement of an optimization problem, Engineering Applications, Classification of optimization problems

Geometric programming (G.P): Solution of an unconstrained geometric programming, differential calculus method and arithmetic method. Primal dual relationship and sufficiency conditions. Solution of a constrained geometric programming problem (G.P.P). Complementary geometric programming (C.G.P), Simple applications of G.P

Dynamic programming (D.P): Multistage decision processes. Concepts of sub optimization, computational procedure in dynamic programming calculus method and tabular methods. Linear programming as a case of D.P. Continuous D.P, simple applications of D.P

Integer programming (I.P): Graphical representation. Gomory's cutting plane method. Bala's algorithm for zero-one programming problem. Branch-and-bound method.

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

Course Outcomes for Final Year First Semester Course	
Course Code: M16 CAD 1105	
Course Title: ADVANCED OPTIMIZATION TECHNIQUES(Elective-I)	
CO-1	Have a basic understanding of conventional and unconventional optimization algorithms..
CO-2	Formulate engineering design problems as mathematical optimization problems and solve them by using suitable optimization technique(s).
CO-3	Use mathematical software for the solution of engineering problems.
CO-4	Several homework assignments delving on core concepts and reinforcing analytical skills learned in class.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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Estd: 1980

SYLLABUS: NEURAL NETWORKS AND FUZZY TECHNIQUES (M16 CAD 1106)

Neural networks and fuzzy systems: Neural and fuzzy machine intelligence, Fuzzy as multivalence, The dynamical - Systems approach to machine intelligence, Intelligent behaviour as adaptive model - Free estimation.

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.

Neuronal dynamics -II: Activation models, Neuronal dynamical systems, Additive neuronal dynamics, Additive neuronal feedback, Additive bivalent models, BAM connection matrices, Additive dynamic and the noise - Saturation dilemma, General neuronal Activations: Cohen- Grossberg and multiplicative models. Synaptic Dynamics I: Unsupervised learning, Learning as encoding, change, and quantization, Four unsupervised learning laws, Probability spaces and random processes, Stochastic unsupervised learning and stochastic equilibrium, Signal Hebbian learning, Competitive learning, Differential Hebbian learning, Differential competitive leering.

Synaptic Dynamics II: Supervised learning, Supervised function estimation, Supervised learning as operant conditioning, Supervised learning as stochastic pattern learning with known class memberships, Supervised learning as stochastic approximation, The back propagation algorithm. Fuzziness Versus: Probability fuzzy sets and systems, Fuzziness in a probabilistic world, Randomness vs. ambiguity: Whether vs. how much, The universe as a fuzzy set, The geometry of fuzzy set, The geometry of fuzzy sets: Sets as points. The fuzzy entropy theorem, Thesubsethood theorem. The entropy-subsethood theorem.

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.

Course Outcomes for Final Year First Semester Course	
Course Code: M16 CAD 1106	
Course Title: NEURAL NETWORKS AND FUZZY TECHNIQUES(Elective-I)	
CO-1	Analyze and appreciate the applications which can use Neural Network and fuzzy logic.
CO-2	Identify and describe NNFL techniques and their roles in building intelligent machines.
CO-3	Design inference systems for decision making in manufacturing industries.
CO-4	Realize the difference between learning and programming and explore practical applications of Neural networks (NN).
CO-5	Demonstrate the use of Neuro-fuzzy network for various industry applications.

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Estd: 1980

SYLLABUS: TOOL DESIGN (M16 CAD 1107)

Introduction to tool design Introduction –Tool Engineering – Tool Classifications– Tool Design Objectives – Tool Design in manufacturing- Challenges and requirements- Standards in tool design-Tool drawings -Surface finish – Fits and Tolerances - Tooling Materials- Ferrous and Nonferrous Tooling Materials- Carbides, Ceramics and Diamond -Nonmetallic tool materials- Designing with relation to heat treatment

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 Introduction – Fixed Gages – Gage Tolerances –selection of material for Gages – Indicating Gages – Automatic gages – Principles of location – Locating methods and devices – Principles of clamping – Drill jigs – Chip formation in drilling – General considerations in the design of drill jigs – Drill bushings – Methods of construction –Thrust and Turning Moments in drilling - Drill jigs and modern manufacturing- Types of Fixtures – Vise Fixtures – Milling Fixtures – Boring Fixtures – Broaching Fixtures – Lathe Fixtures – Grinding Fixtures – Modular Fixtures – Cutting Force Calculations.

Design of press tool dies Types of Dies –Method of Die operation–Clearance and cutting force calculations-Blanking and Piercing die design – Pilots – Strippers and pressure pads- Presswork materials – Strip layout – Short-run tooling for Piercing – Bending dies – Forming dies – Drawing dies-Design and drafting.

Tool design for CNC machine tools Introduction –Tooling requirements for Numerical control systems – Fixture design for CNC machine tools- Sub plate and tombstone fixtures-Universal fixtures– Cutting tools– Tool holding methods– Automatic tool changers and tool positioners – Tool presetting– General explanation of the Brown and Sharp machine.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CAD 1107	
Course Title: TOOL DESIGN	
CO-1	Classify different types of tools used for different manufacturing processes.
CO-2	Design of Jigs and Fixtures, Press tool dies and tool design for CNC machines.
CO-3	Design different machine tools considering static and dynamic loads.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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Estd: 1980

SYLLABUS: DESIGN OF HYDRAULIC AND PNEUMATIC SYSTEMS (M16 CAD 1108)

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.

Hydraulic circuits Reciprocation, quick return, sequencing, synchronizing circuits - accumulator circuits - industrial circuits - press circuits - hydraulic milling machine - grinding, planning, copying, - forklift, earth mover circuits- design and selection of components - safety and emergency mandrels.

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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CAD 1108	
Course Title: DESIGN OF HYDRAULIC AND PNEUMATIC SYSTEMS(Elective-II)	
CO-1	Can explain the similarities and differences of the electrical, pneumatic and hydraulic systems
CO-2	Can decide which system is better for a specific application.
CO-3	Can explain the basic parts of the industrial hydraulic and pneumatic systems and their functions.
CO-4	Can design a hydraulic or pneumatic system circuit by using related software and make simulations
CO-5	Can design a hydraulic or pneumatic system and outline PLC control algorithm for a predefined automation process

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Estd: 1980

SYLLABUS: PRODUCT DESIGN (M16 CAD 1109)

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.

Economic factors influencing design: Economic analysis, Break-even analysis, Human engineering considerations, Ergonomics, Design of controls, Design of displays. Value engineering, Material and process selection in value engineering, Modern approaches in design.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CAD 1109	
Course Title: PRODUCT DESIGN(Elective-II)	
CO-1	Apply various tools of problem solving to arrive at a fruitful design
CO-2	Analyse the factors influencing the design.
CO-3	Determine the risk and reliability aspects associated with product design.
CO-4	Select appropriate manufacturing processes to realize the product design.
CO-5	design an eco-friendly product.

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Estd: 1980

SYLLABUS: ADVANCED NUMERICAL METHODS (M16 CAD 1110)

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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CAD 1110	
Course Title: ADVANCED NUMERICAL METHODS(Elective-II)	
CO-1	Find the solutions of system of linear and non-linear equations.
CO-2	Solve ordinary and partial differential equations numerically
CO-3	Find a approximation solution for engineering problems using finite difference and finite element methods.

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Estd: 1980

SYLLABUS: CAD LAB (M16 CAD 1111)

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.

Course Outcomes for First Year First Semester Course	
Course Code: M16 CAD 1111	
Course Title: CAD LAB	
CO-1	Model the automobile parts using modelling package like SOLID WORKS
CO-2	Analyze different engineering problems using ANSYS software

SYLLABUS: COMPUTER INTEGRATED MANUFACTURING (M16 CAD 1201)

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.

Computer aided process planning: Approaches to process planning - Manual, Variant, Generative approach, Process planning systems - CAPP, DCLASS, CMPP, Criteria for selecting a CAPP system, Part feature recognition, Artificial intelligence in process planning.

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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CAD 1201	
Course Title: COMPUTER INTEGRATED MANUFACTURING	
CO-1	Understand the effect of manufacturing automation strategies and derive production metrics.
CO-2	Analyze automated flow lines and assembly systems, and balance the line.
CO-3	Design automated material handling and storage systems for a typical production system.
CO-4	Design a manufacturing cell and cellular manufacturing system
CO-5	Develop CAPP systems for rotational and prismatic parts.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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Estd: 1980

SYLLABUS: MECHATRONICS (M16 CAD 1202)

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.

Sensors and transducers: An introduction to sensors and transducers, Sensors for motion and position measurement, Force, torque and tactile sensors, Flow sensors, Temperature-sensing devices. Actuating devices: Direct current motor, Permanent magnet stepper motor, Fluid power actuation.

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, Micro sensors in mechatronics.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CAD 1202	
Course Title: MECHATRONICS	
CO-1	Model and analyze electrical and mechanical systems and their interconnection.
CO-2	Integrate mechanical, electronics, control and computer engineering in the design of mechatronics systems.
CO-3	Do the complete design building, interfacing and actuation of a mechatronic system for a set of specifications.

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Estd: 1980

SYLLABUS: FLEXIBLE MANUFACTURING SYSTEMS (M16 CAD 1203)

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 data base, 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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CAD 1203	
Course Title: FLEXIBLE MANUFACTURING SYSTEMS	
CO-1	Classify and distinguish FMS and other manufacturing systems including job-shop and mass production systems.
CO-2	Explain processing stations and material handling systems used in FMS environments.
CO-3	Design and analyse FMS using simulation and analytical techniques.
CO-4	Understand tool management in FMS.
CO-5	Analyze the production management problems in planning, loading, scheduling, routing and breakdown in a typical FMS

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Estd: 1980

SYLLABUS: FINITE ELEMENT ANALYSIS (M16 CAD 1204)

Introduction to FEM, basic concepts, historical back ground, 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.

1-D Structural Problems: Axial bar element – stiffness matrix, load vector, temperature effects, Quadratic shape functions and problems. ANALYSIS OF TRUSSES: Plane Trusses and Space Truss elements and problems. ANALYSIS OF BEAMS: Hermite shape functions – stiffness matrix – Load vector – Problems.

Problems: CST, LST, force terms, Stiffness matrix and load vectors, boundary conditions, Isoparametric elements – quadrilateral element, shape functions – Numerical Integration. Finite element modeling of Axi- symmetric solids subjected to Axi-symmetric loading with triangular elements. 3-D PROBLEMS: Tetrahedran element – Jacobian matrix – Stiffness matrix.

Scalar Field Problems: 1-D Heat conduction-Slabs – fins - 2-D heat conduction problems – Introduction to Torsional problems.

Dynamic considerations, Dynamic equations – consistent mass matrix – Eigen Values, Eigen vector, natural frequencies – mode shapes – modal analysis.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CAD 1204	
Course Title: FINITE ELEMENT ANALYSIS	
CO-1	Understand the principles and concepts related to finite element methods.
CO-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.
CO-3	Numerically solve for deformation, stresses and strains of a structural component subjected to axial, torsion, and bending loads.
CO-4	Understand the basic knowledge about finite element methods for solving time- dependent and/or non-linear problems.
CO-5	Use commercial software package to perform structural and thermal analysis and are able to conduct engineering design.

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Estd: 1980

SYLLABUS: VISION SYSTEMS AND IMAGE PROCESSING (M16 CAD 1205)

Machine vision - Vision sensors - Comparison with other types of sensors - Image acquisition and recognition - Recognition of 3D objects - Lighting techniques - Machine vision applications. Image representation - Application of image processing - Image sampling, Digitization and quantization - Image transforms.

Spatial domain techniques - Convolution, Correlation. Frequency domain operations - Fast Fourier transforms, FFT, DFT, Investigation of spectra. Hough transform

Image enhancement, Filtering, Restoration, Histogram equalization, Segmentation, Region growing.

Image compression - Edge detection - Thresholding - Spatial smoothing - Boundary and Region representation - Shape features - Scene matching and detection - Image classification.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CAD 1205	
Course Title: VISION SYSTEMS AND IMAGE PROCESSING(Elective-III)	
CO-1	Basic image processing techniques for solving real problems
CO-2	Analyze general terminology of digital image processing
CO-3	Understand fundamental concepts and theory of Discrete Fourier Series and Discrete Fourier Transform.
CO-4	Examine various types of images, intensity transformations and spatial filtering.
CO-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.

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SYLLABUS: INTELLIGENT MANUFATURING SYSTEMS (M16 CAD 1206)

Computer Integrated Manufacturing Systems Structure and functional areas of CIM system, - CAD, CAPP, CAM, CAQC, ASRS. Advantages of CIM. Manufacturing Communication Systems - MAP/TOP, OSI Model, Data Redundancy, Top- down and Bottom-up Approach, Volume of Information. Intelligent Manufacturing System Components, System Architecture and Data Flow, System Operation.

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.

Automated Process Planning - Variant Approach, Generative Approach, Expert Systems for Process Planning, Feature Recognition, Phases of Process planning. Knowledge Based System for Equipment Selection (KBSES) - Manufacturing system design. Equipment Selection Problem, Modeling the Manufacturing Equipment Selection Problem, Problem Solving approach in KBSES, Structure of the KRSES.

Group Technology: Models and Algorithms Visual Method, Coding Method, Cluster Analysis Method, Matrix Formation - Similarity Coefficient Method, Sorting-based Algorithms, Bond Energy Algorithm, Cost Based method, Cluster Identification Method, Extended CI Method. Knowledge Based Group Technology - Group Technology in Automated Manufacturing System. Structure of Knowledge based system for group technology (KBSCIT) — Data Base, Knowledge Base, Clustering Algorithm.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CAD 1206	
Course Title: INTELLIGENT MANUFATURING SYSTEMS(Elective-III)	
CO-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

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SYLLABUS: CONCURRENT ENGINEERING (M16 CAD 1207)

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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CAD 1207	
Course Title: Concurrent Engineering(Elective-III)	
CO-1	Understand the concepts of concurrent engineering and its application in design and manufacturing of a product
CO-2	Know how to solve issues arising during design and manufacturing of a product
CO-3	Understand the importance of tolerances in product design and manufacturing
CO-4	Understand how to automate a work station& fabrication system.
CO-5	Understand the importance of human resource management

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Estd: 1980

SYLLABUS: SIGNAL ANALYSIS AND CONDITION MONITORING (M16 CAD 1208)

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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CAD 1208	
Course Title: SIGNAL ANALYSIS AND CONDITION MONITORING (Elective-IV)	
CO-1	Understand the concepts of Fourier analysis and practical analysis of various signals.
CO-2	Develop an appreciation for the need of modern technological approach for plant maintenance to reduce the maintenance expenditure.
CO-3	Analyze for machinery condition monitoring and explain how this compliments monitoring the condition.

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Estd: 1980

SYLLABUS: ADDITIVE MANUFACTURING (M16 CAD 1209)

Introduction: Need - Development of AM systems – AM process chain - Impact of AM on Product Development - Virtual Prototyping- Rapid Tooling – RP to AM -Classification of AM processes-Benefits- Applications.

Reverse engineering and cad modeling: Basic concept- Digitization techniques – Model reconstruction – Data Processing for Rapid Prototyping: CAD model preparation, Data requirements – Geometric modeling techniques: Wire frame, surface and solid modeling – data formats - Data interfacing, Part orientation and support generation, Support structure design, Model Slicing, Tool path generation-Software for AM- Case studies.

Liquid based and solid based additive manufacturing systems: Stereolithography Apparatus (SLA): Principle, pre-build process, part-building and post-build processes, photo polymerization of SL resins, part quality and process planning, recoating issues, materials, advantages, limitations and applications. Solid Ground Curing (SGC): working principle, process, strengths, weaknesses and applications. Fused deposition Modeling (FDM): Principle, details of processes, process variables, types, products, materials and applications. Laminated Object Manufacturing (LOM): Working Principles, details of processes, products, materials, advantages, limitations and applications - Case studies.

Powder based additive manufacturing systems: Selective Laser Sintering (SLS): Principle, process, Indirect and direct SLS- powder structures, materials, post processing, surface deviation and accuracy, Applications. Laser Engineered Net Shaping (LENS): Processes, materials, products, advantages, limitations and applications– Case Studies.

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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CAD 1209	
Course Title: ADDITIVE MANUFACTURING(Elective-IV)	
CO-1	Assess the need of RPT in Product development.
CO-2	Judge the correct RP Process for Product/Prototype development.
CO-3	Predict the technical challenges in 3D printing.
CO-4	List the applications of RPT

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SYLLABUS: METROLOGY AND NON DESTRUCTIVE TESTING (M16 CAD 1210)

Measuring machines Tool Maker's microscope - Co-ordinate measuring machines - Universal measuring machine - Laser viewers for production profile checks - Image shearing microscope - Use of computers - Machine vision technology - Microprocessors in metrology.

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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CAD 1210	
Course Title: METROLOGY AND NON DESTRUCTIVE TESTING	
CO-1	Know how to use different measuring instruments.
CO-2	Understand the philosophy and basic concepts of quality improvement.
CO-3	Determine basic process capability, evaluate measurement error, and evaluate simple acceptance sampling plans
CO-4	Select and carryout appropriate NDT techniques in accordance with established procedures.

SYLLABUS: CAM LAB (M16 CAD 1211)

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.

Course Outcomes for First Year Second Semester Course	
Course Code: M16 CAD 1211	
Course Title: CAM LAB	
CO-1	Illustrate the importance of NC and CNC technology in manufacturing industry.
CO-2	Generate Part Programming with application of CAD/CAM systems in particular for complex models.
CO-3	Identify and select proper NC toolings