Regulation: R19			**I / II - M.Tech. I - Semester**						
STRUCTURAL ENGINEERING (Under Choice Based Credit System / Elective Course System)									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2019-20 admitted Batch onwards)									
Course Code	**Course Name**	**Category**	**Cr.**	**L**	**T**	**P**	**Int. Marks**	**Ext. Marks**	**Total Marks**
M19 ST1101	Theory of Elasticity	PC	3	3	0	0	25	75	100
M19 ST1102	Structural Dynamics	PC	3	3	0	0	25	75	100
#PE-I	Program Elective-I	PE	3	3	0	0	25	75	100
#PE-II	Program Elective-II	PE	3	3	0	0	25	75	100
M19 ST1109	Advanced Concrete Technology	PC	2	2	0	0	25	75	100
M19ST1110	Advanced Concrete Laboratory	PC	2	0	0	4	25	75	100
M19 ST1111	Advanced Structural Engineering Laboratory	PC	2	0	0	4	25	75	100
#AC-1	Audit course -1	AC	0	2	0	0	0	0	0
TOTAL			**18**	**16**	**0**	**8**	**175**	**525**	**700**

	Code	**Course**		**Code**	**Course**
#PE-I	M19ST1103	Matrix Methods of Structures	**#AC 1 & 2**	M19AC0001	English for Research Paper Writing
	M19ST1104	Analytical & Numerical Methods for Structural Engineering		M19AC0002	Disaster Management
	M19ST1105	Design of RCC Foundations		M19AC0003	Sanskrit for Technical Knowledge
				M19AC0004	Value Education
				M19AC0005	Constitution of India
#PE-II	M19ST1106	Bridge Engineering		M19AC0006	Pedagogy Studies
	M19ST1107	Repair and Rehabilitation of Structures		M19AC0007	Stress Management by Yoga
	M19ST1108	Advanced Reinforced Concrete Design		M19AC0008	Personality Development through Life Enlightenment Skills.

STRUCTURAL ENGINEERING
SYLLABUS : THEORY OF ELASTICITY (M19ST1101)

UNIT-I: Elasticity – Notation for forces and stresses – components of stresses and strains – Hooke's Law - Plane Stress – Plane strain – Differential Equations of equilibrium – Boundary conditions – Compatibility equations - Stress function – Boundary Conditions.

UNIT-II : Two dimensional problems in rectangular co- ordinates – Solution by polynomials – SaintVenant's principle – Determination of displacements – Bending of simple beams – Application of Fourier series for two dimensional problems for gravity loading

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

UNIT-IV: Analysis of stress and strain in three dimension - Principal stresses – Stress ellipsoid and stress director surface – Determination of principal stresses - Maximum shear stress – Homogeneous Deformation – General Theorems - Differential equations of equilibrium – Conditions of compatibility– Equations of equilibrium in terms of displacements – Principle of superposition – Uniqueness of solution –Reciprocal theorem.

UNIT-V: Torsion of Prismatic bars – Bars with elliptical cross section – Other elementary solution Membrane analogy – Torsion of rectangular bars – Solution of Torsional problems byenergy method.

Course Outcomes for First Year First Semester Course	
Course Code: M19ST1101	
Course Title: THEORY OF ELASTICITY	
CO-1	Understand the notations of stress and strain
CO-2	Analyze the stresses and strains in rectangular co-ordinate system and
CO-3	Analyze the stresses and strains in polar co-ordinate system
CO-4	Evaluate the equilibrium and compatibility conditions
CO-5	Analyze members for different shaped bars subjected to torsion.

SYLLABUS: STRUCTURAL DYNAMICS (M19ST1102)

UNIT-I: Theory of vibrations: Introduction - Elements of vibratory system - Degrees of Freedom - Continuous System - Lumped mass idealization - Oscillatory motion - Simple Harmonic motion - Victorian representation of S.H.M. - Free vibrations of single degree of freedom system – un damped and damped vibrations - critical damping - Logarithmic decrement - Forced vibration ofSDOF systems - Harmonic excitation - Vibration Isolation -Dynamic magnification factor – Phase angle.

UNIT-II: Introduction to Structural Dynamics : Fundamental objectives of dynamic analysis -Types of prescribed loading - Methods of discretization - Formulation of equations of motion by differentmethods – Direct equilibration using Newton‟s law of motion / D‟Alembert‟s Principle, Principle of virtual work and Hamilton principle. **Single Degree of Freedom Systems:** Formulation and solution of the equation of motion - Free vibration response - Response to Harmonic, Periodic, Impulsive and general dynamic loadings - Duhamel integral.

UNIT-III: Multi Degree of Freedom Systems: Selection of the degrees of Freedom - Evaluation of structural property matrices - Formulation of the MDOF equations of motion -Undamped free vibrations - Solutions of Eigen value problem for natural frequencies and mode shapes - Analysis of Dynamic response – Normal co-ordinates - Uncoupled equations of motion - Orthogonal properties of normal modes - Mode superposition procedure.

UNIT-IV: Practical Vibration Analysis: Introduction - Stodola method - Fundamental mode analysis - Analysis of second and higher modes - Holzer method - Basic procedure.**Continuous Systems:** Introduction - Flexural vibrations of beams - Elementary case – Derivation of governing differential equation of motion - Analysis of undamped free vibrations of beams in flexure - Natural frequencies and mode-shapes of simple beams with different end conditions – Principles of application to continuous beams.

UNIT-V: Introduction to Earthquake Analysis: Deterministic Earthquake Response: Systems on Rigid Foundations -Types of Earthquake Excitations – Lumped SDOF Elastic Systems, Translational Excitations - Generalized coordinate -SDOF Elastic Systems, Translational Excitations, Linear Static Method – Analysis for obtaining response of multi storied RC Building.

Course Outcomes for First Year First Semester Course	
Course Code: M19ST1102	
Course Title: STRUCTURAL DYNAMICS	
CO-1	Understand the response of structural systems to dynamic loads
CO-2	Understand the behavior and response of linear and nonlinear SDOF and MDOF structures with various dynamic loading
CO-3	Understand the behavior and response of MDOF structures with various Dynamic loading.
CO-4	Possess the ability to find out suitable solution for continuous system
CO-5	Understand the behavior of structures subjected to dynamic loads under free vibration
CO-6	Understand the behavior of structures subjected to dynamic loads Harmonic excitation and earthquake load.

SYLLABUS: MATRIX METHODS OF STRUCTURES (M19ST1103)

UNIT-I: Introduction of matrix methods of analysis – Static and kinematic indeterminacy – Degreeof freedom– Structure idealization- stiffness and flexibility methods – Suitability: Element -stiffness matrix for truss element, beam element and Torsional element-Element force-displacement equations.

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

UNIT-III: Stiffness method for Grid elements – development of stiffness matrix coordinates transformation. Examples of grid problems – tapered and curved beams

UNIT-IV: Additional topics in stiffness methods – discussion of band width – semi band width – static condensation – sub structuring –Loads between joints- Support displacements- inertial and thermal stresses- Beams on elastic foundation by stiffness method.

UNIT-V: Analysis of plane truss - continuous beams with and without settlement - plane frame including side sway single storey, single – bay and gable frame by flexibility method usingsystem approach.

Course Outcomes for First Year First Semester Course	
Course Code: M19ST1103	
Course Title: MATRIX METHODS OF STRUCTURES	
CO-1	Perform the structural analysis of determinate and indeterminate structures using classical compatibility methods, such as method of consistent displacements, forceand equilibrium Methods
CO-2	Perform structural analysis using the stiffness method.
CO-3	Solve multiple degree of freedom two and three dimensional problems involving trusses, beams, frames and plane stress
CO-4	Understand basic finite element analysis

SYLLABUS: ANALYTICAL & NUMERICAL METHODS FOR STRUCTURAL ENGINEERING (M19ST1104)

UNIT-I: Transform Methods- Laplace transform methods for one-dimensional wave equation - Displacements in a long string - Longitudinal vibration of an elastic bar - Fourier transforms methods for one-dimensional heat conduction problems in infinite and semi- infinite rod.

UNIT-II: Elliptic Equations-Laplace equation - Properties of harmonic functions - Fourier transform methods for Laplace equation **Calculus Of Variations-** Variation and its properties - Euler's equation - Functional dependent on first and higher order derivatives - Functional dependent on functions of several independent variables - Some applications - Direct methods - Ritz and Kantorovich methods

UNIT-III: Integral Equations- Fred holm and Volterra integral equations - Relation between differential and integral equations - Green's function –Fred holm equation with separable kernel - Iterative method for solving equations of second kind.

UNIT-IV: Finite Difference and their Applications: Introduction- Differentiation formulas by Interpolating parabolas – Backward and forward and central differences- Derivation of Differentiation formulas using Taylor series- Boundary conditions- Beam deflection – Solution of characteristic value problems - Richardson's extrapolation - Use of unevenly spaced pivotal points- Integration formulae by interpolating parabolas- Numerical solution to spatial differential equations – Application to Simply Supported Beams, Columns & rectangular Plates.

UNIT-V: Numerical Differentiation: Difference methods based on undetermined coefficients- optimum choice of step length– Partial differentiation. Numerical Integration: Methodbased on interpolation-method based on undetermined coefficient – Gauss – Lagrange interpolation method- Radaua integration method- composite integration method – Double integration using Trapezoidal and Simpson's method – New Marks Method and Applicationto Beams – Calculations of Slopes & Deflections.

Course Outcomes for First Year First Semester Course	
Course Code: M19ST1104	
Course Title: ANALYTICAL & NUMERICAL METHODS FOR STRUCTURAL ENGINEERING	
CO-1	Understand the applications of Laplace and Fourier transforms
CO-2	Implement the principles and techniques of Variations
CO-3	Find the solutions for different kinds of integral equations
CO-4	Adopt the principles and techniques of finite difference methods
CO-5	Use Numerical differentiation and integration techniques for finding numerical solutions

SYLLABUS: DESIGN OF REINFORCED CONCRETE FOUNDATIONS (M19ST1105)

UNIT-I: Foundation Structures & Design of Centrally Loaded Isolated Footings and Column Pedestals – Introduction, Rigid and Flexible Foundations, Loads and their Effects, Design Requirements, Geotechnical Design, Empirical and Exact Methods of Analysis offoundations, Design Loads for Foundations, Recommended Approach to Structural Design of Foundations. Introduction, General Procedure for Design, Design of Square Footing of Uniform Depth (Pad Footing), Design of sloped Rectangular Footings, Design Procedure, Detailing of Steel, Design of Rectangular Pad Footings, Design of Plain Concrete Footings,
Design of Pedestals, Design Calculation for Pedestals.

UNIT-II: Wall Footings –Introduction Simple Plain Concrete Wall Footings, Reinforced Concrete Continuous Strip Wall Footings, Design of continuous Strip Wall Footings, Design for Longitudinal Steel, R.C.T Beam Footings in Shrinkable Soils, Foundations of Partition Wall in Ground Floors, Summary.Strip Footings Under Several Columns – Introduction, Design Procedure for Equally loaded and Equally Spaced Columns, Analysis of Continuous Strip Footing for Unsymmetrical Loading, Analysis of Strip Footing with Unsymmetrical Loads, Detailing of Members.

UNIT-III: Raft Foundations –Introduction, Rigid and Flexible Foundations, common Types of Rafts,Deflection Requirements of Beams and Slabs in Rafts, General considerations in Design of Rigid Rafts, Types of Loadings and Choice of Rafts, Record of Contact Pressures Measured Under Rafts, Modern Theoretical Analysis. **Design of Flat Slab Rafts-MatFoundations –** Introduction, Components of Flat Slabs, Preliminary Planning of Flat Slab Rafts, Analysis of Flat Slab by Direct Design Method, Method of Analysis, Values for Longitudinal Distribution and Transverse, Redistribution, Shear in Flat Slabs, Bending of Columns in flat Slabs, Limitations of Direct Design Method for Mats, Detailing of Steel, Design of Edge Beam in Flat Slabs. **Beam and Slab Rafts –** Introduction, Planning of the Raft, Action of the Raft, Approximate Dimensioning of the Raft, Design of the Beam and Slab Raft under Uniform Pressure, Structural Analysis for the Main Slab, Design ofSecondary and Main Beams, Analysis by Winkler Model, Detailing of Steel.

UNIT-IV: Combined Piled Raft Foundations (CPRF) – Introduction, Types and uses of Piled Rafts, ,
Interaction of Pile and Raft, Ultimate Capacity and Settlement of Piles, Estimation of Settlement of Raft in Soils, Allowable Maximum and Differential Settlement in Buildings, Design of CPRF System, conceptual Method of Design, Conceptual Method of Analysis, Distribution of Piles in the Rafts, Theoretical Methods of Analysis.
Circular and Annular Rafts – Introduction, Positioning of chimney Load on Annular Raft, Forces Acting on Annular Rafts, Pressures Under Dead Load and Moment, Methods of Analysis, Conventional Analysis of Annular

Rafts, Analysis of Ring Beams Under circular Layout of Columns, Analysis of Ring Beam Transmitting Column Load to Annular Rafts, Detailing of Annular Raft Under Columns of a Circular Water Tank.

UNIT-V: Under-reamed Pile Foundations – Introduction, Safe Loads on Under-reamed Piles, Design of Under-reamed Pile Foundation for Load Bearing Walls of Buildings, Design of Grade Beams, Design of Under-reamed Piles Under Columns of Buildings, Use of Under-reamed Piles for Expansive Soils. Design of cantilever and Basement Retaining Walls – Introduction,Earth Pressure and Rigid Walls, Calculation of Earth Pressure on Retaining Walls, Design ofRigid Walls, Design of Ordinary R.C. cantilever Walls, Design of cantilever Walls without Toe, Design of Basement Walls, Calculation of Earth Pressures in Clays, Design of Free Standing Basement Walls.

Course Outcomes for First Year First Semester Course	
Course Code: M19ST1105	
Course Title: DESIGN OF REINFORCED CONCRETE FOUNDATIONS	
CO-1	Attain the perception of site investigation to select suitable type of foundation based on soil category
CO-2	Capable of ensuring design concepts of shallow foundation
CO-3	Can be efficient in selecting suitable type of pile for different soil stratum and inevaluation of group capacity by formulation
CO-4	Design different types of well foundation

SYLLABUS: BRIDGE ENGINEERING (M19ST1106)

UNIT-I: Concrete Bridges: Introduction-Types of Bridges-Economic span length-Types of loading- Dead load-live load-Impact Effect-Centrifugal force-wind loads-Lateral loads-Longitudinalforces- Seismic loads- Frictional resistance of expansion bearings-Secondary Stresses- Temperature Effect-Erection Forces and effects-Width of roadway and footway-General Design Requirements.

UNIT-II: Pigeaud"s method- design of longitudinal girders-Guyon-Messonet method- Hendry Jaegar method-Courbon"s theory. (Ref: IRC- 21), voided slabs,Super Structure: Slab bridge- Wheel load on slab-effective width method- slabs supported on two edges- cantilever slabs- dispersion length- Design of interior panel of slab- T- Beam bridges.

UNIT-III: Box Culverts- Single Cell Box Culvert – Design Loads, Design Moments, Shears and Thrusts. Design of Critical sections.

UNIT-IV: Plate girder bridges - Elements of plate girder and their design-web-flange -intermediate stiffener-vertical stiffeners- bearing stiffener- Design problem.

UNIT-V: Sub structure- Abutments- Stability analysis of abutments- piers- loads on piers – Analysis of piers-Design problem(Ref: IRC- 13, IRC- 21, IRC- 78)- Pipe culvert- Flow pattern in pipe culvers- culvert alignment-culvert entrance structure- Hydraulic design and structural design of pipe culverts- reinforcements in pipes .(Ref: IRC: SP-13)

Course Outcomes for First Year First Semester Course	
Course Code: M19ST1106	
Course Title: BRIDGE ENGINEERING	
CO-1	To decide the structural form for a bridge depending on the functional requirements and site conditions. Identify various structural components of thechosen bridge form.
CO-2	Design theories for super structure and substructure of bridges, R.C.C T Beam Bridge.
CO-3	Design of box culverts.
CO-4	Design of railway bridges, plate girder bridges.
CO-5	Stability analysis of abutments, different types of bearings, abutments, piers and various types of foundations for Bridges

SYLLABUS: REPAIR AND REHABILITATION OF STRUCTURES (M19ST1107)

UNIT-I: Materials for repair and rehabilitation-Admixtures- types of admixtures- purposes of using admixtures- chemical composition- Natural admixtures- Fibers- wraps- Glass and Carbon fiber wraps-Steel Plates-Non destructive evaluation:Importance-Concrete behavior under corrosion, disintegrated mechanisms- moisture effects and thermal effects– Visual investigation- Acoustical emission methods- Corrosion activity measurement-chloride content – Depth of carbonation- Impact echo methods- Ultrasound pulse velocity methods- Pull out tests.

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

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

UNIT-IV: Fibre reinforced concrete- Properties of constituent materials- Mix proportions, mixing and casting methods- Mechanical properties of fiber reinforced concrete- applications of fiber reinforced concretes-Light-weight concrete- properties of light weight concrete- No fines concrete- design of light weight concrete-Fly ash concrete- Introduction- classification of fly ash- properties and reaction mechanism of fly ash- Properties of fly ash concrete in fresh state and hardened state- Durability of fly ash concretes

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

Course Outcomes for First Year First Semester Course	
Course Code: M19ST1107	
Course Title: REPAIR AND REHABILITATION OF STRUCTURES	
CO-1	Recognize the various materials for repair and rehabilitation. Non- destructive evaluation of concrete structures.
CO-2	Design and suggest repair strategies for deteriorated concrete structures including repairing with composites.
CO-3	Understand the methods of strengthening methods for concrete structures.
CO-4	Design of special concretes.

SYLLABUS: ADVANCED REINFORCED CONCRETE DESIGN (M19ST1108)

UNIT-I: Limit Analysis of R C Structures: Rotation of a plastic hinge, Redistribution of moments, moment rotation characteristics of RC member, I.S.code provisions, loading pattern, Bending Moment Envelop, Application for Fixed Beams and Continuous Beams. Inelastic Analysis of Slabs ,Moment Redistribution.

UNIT-II: Yield line analysis for slabs: Yield line criterion – Virtual work and equilibrium methods of analysis – For square circular, Rectangular, Triangular and Hexagonal with simple and continuous end conditions.

UNIT-III: Ribbedslabs:AnalysisoftheSlabsforMomentandShears,UltimateMomentofResistance, Design for shear, Deflection, Arrangement of Reinforcements. Flat slabs: Direct design method – Distribution of moments in column strips and middle strip- moment and shear transfer from slabs to columns – Shear in Flat slabs-Check for one way and two way shears Introduction to Equivalent frame method. Limitations of Direct design method, Distribution of moments in column strips and middle strip sketch showing reinforcement details.

UNIT-IV: DesignofReinforcedConcreteDeepBeams&Corbels:StepsofDesigningDeepBeams, Design by IS 456. Checking for Local Failures, Detailing of Deep Beams, Analysis of Forces in a Corbels, Design of Procedure of Corbels, Design of Nibs. Detailing of reinforcement.

UNIT-V: Design of Slender Columns – Slenderness limits, Methods of Design of Slender Columns,AdditionalMomentMethod,ProcedureforDesignofSlenderColumns.Detailingofreinforcement.EccentricallyLoadedcolumns- development of interaction Diagrams

Course Outcomes for First Year First Semester Course	
Course Code: M19ST1108	
Course Title: ADVANCED REINFORCED CONCRETE DESIGN	
CO-1	Analyze fixed and continuous beams after redistribution of moments
CO-2	Apply virtual work/equilibrium method for analysis of R.C Elements
CO-3	Design flat slab with and without drop panel or column heads
CO-4	Analyze and Design deep beams
CO-5	Compute/determinate manually inslender columns

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SYLLABUS: ADVANCED CONCRETE TECHNOLOGY (M19ST1109)

UNIT-I: Concrete Making Materials : Cement – Bogus Compounds – Hydration Process – Types of Cement – Aggregates Gradation Charts – Combined Aggregate – Alakali Silica Reaction –Admixtures–Chemical and Mineral Admixtures. Bureau of Indian Standards (BIS) Provisions

UNIT-II: Fresh And Hardened Concrete: Fresh Concrete – workability tests on Concrete – Setting Times of Fresh Concrete– Segregation and bleeding. Hardened Concrete: Abrams Law, Gelspace ratios, Maturity concept – Stress strain Behaviour-Creep and Shrinkage – Durability Testson Concrete–Non Destructive Testing of Concrete .BIS Provisions.

UNIT-III: High Strength Concrete – Microstructure – Manufacturing and Properties – Design of HSC Using Erintroy Shaklok method – Ultra High Strength Concrete. High Performance Concrete–Requirements and Properties of High Performance Concrete–Design Considerations.BIS Provisions.

UNIT-IV: Special Concretes: Self Compacting concrete, Polymer Concrete, Fibre Reinforced Concrete – Reactive Powder Concrete – Requirements and Guidelines – Advantages and Applications. **Concrete Mix Design:** Quality Control – Quality Assurance – Quality Audit -Mix Design Method – BIS Method – IS.10262 – 2019 Concrete Mix proportion guidelines. DOE Method–Light Weight Concrete, Self Compacting Concrete.

UNIT-V: Formwork–materials–structural requests–form work systems–connections–specifications–design of form work–shores–removal for forms-shores–re shoring– failure of formwork.

Course Outcomes for First Year First Semester Course	
Course Code: M19ST1109	
Course Title: ADVANCED CONCRETE TECHNOLOGY	
CO-1	Classify and explain various concrete making materials
CO-2	Apply fundamental knowledge in the fresh hardened and high strength properties of concrete
CO-3	Determinetheapplicationanduseofvariousspecialconcreteandformwork
CO-4	Design and develop a concrete mix design for different codes.

SYLLABUS: ADVANCED CONCRETE TECHNOLOGY LABORATORY (M19ST1110)

1. Study on Water/ Cement Ratios Vs Workability of different concretes
2. Study on Water/ Cement Ratios Vs Strength of different concretes
3. Study of variation of Coarse Aggregate to Fine Aggregates on Workability
4. Study of variation of Coarse Aggregate to Fine Aggregates on Strength
5. Strain measurement -Electrical resistance strain gauges
6. Non Destructive testing- Impact Hammer test, UPV test
7. Qualifications tests on Self compaction concrete-LBox, JBox, Ubox and Slump tests

Course Outcomes for First Year First Semester Course	
Course Code: M19ST1110	
Course Title: ADVANCEDCONCRETETECHNOLOGYLABORATORY	
CO-1	Conduct various laboratory tests on Cement ,Aggregates
CO-2	Know the strain measurement
CO-3	Perform Non-Destructive testing of concrete
CO-4	Chemical analysis on concrete and Aggregate and Sand

SYLLABUS: ADVANCED STRUCTURAL ENGINEERING LABORATORY (M19ST1111)
(Common to All Branches)

1. StudyonDeflectionandCracksonaUnderReinforcedOverReinforcedandBalancedSections
2. Study on Performance of RCC Beams designed for Bending and failing in Shear
3. Study on Performance of RCC Beams designed for Shear and failing in Bending
4. Study on Performance of RCCO neways labs
5. Study on Performance of RCCT woways labs with simply supported edge conditions
6. Study on Performance of RCCT woways labs with fixed edge conditions
7. Calculation of Young's Modulus of Elasticity of Concrete
8. Extraction and Study of Concrete Core samples from pavements

Course Outcomes for First Year First Semester Course	
Course Code: M19ST1111	
Course Title: ADVANCEDSTRUCTURALENGINEERINGLABORATORY	
CO-1	Design and test the deflection and cracks in R.C. Beams
CO-2	Design and test the Shear behavior in RCC Beam
CO-3	Design and test the flexure behavior in RCC Beam
CO-4	Design and test the flexure behavior in RCC one ways lab and Two ways labs
CO-5	Determine the Young's Modulus of Elasticity of Concrete

SYLLABUS: ENGLISHFORRESEARCHPAPERWRITING (M19AC0001)

UNIT-I: Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs And Sentences, Being Concise and Removing Redundancy ,Avoiding Ambiguity and Vagueness

UNIT-II: Clarifying Who Did What, Highlighting Your Findings, Hedging And Criticizing Paraphrasing and Plagiarism ,Sections of a Paper.

UNIT-III: Abstracts, Introduction, Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-IV: Key skills are needed when writing a Title, key skills are needed when writing an abstract, key skills are needed when writing an introduction ,skills needed when writing a Review of the Literature, skills are needed when writing the Methods.

UNIT-V: skills needed when writing the Results skills are needed when writing the Discussion, skills are needed when writing the Conclusions ,useful phrases ,how to ensure paper is as good as it could possibly be the first-time submission

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0001	
Course Title: ENGLISHFORRESEARCHPAPERWRITING	
CO-1	Understand that how to improve your writing skills and level of readability
CO-2	Learn about what to write in each section
CO-3	UnderstandtheskillsneededwhenwritingaTitleEnsurethegoodqualityof paper at very first time submission

SYLLABUS: DISASTERMANAGEMENT (M19AC0002)

UNIT-I: Disaster :Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manma de Disasters :Difference ,Nature ,Types And Magnitude.

UNIT-II: EconomicDamage,LossOfHumanAndAnimalLife,DestructionOfEcosystem.Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oi Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts

UNIT-III: Disaster Prone Areas In India: Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics.

UNIT-IV: Disaster Preparedness And Management: Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

UNIT-V:RiskAssessment: Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

Disaster Mitigation Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

SYLLABUS: SANSKRITFORTECHNICALKNOWLEDGE (M19AC0003)

UNIT-I: Alphabets in Sanskrit, Past/Present/FutureTense, Simple Sentences

UNIT-II: Order, Introduction of roots, Technical information about Sanskrit Literature

UNIT-III: TechnicalconceptsofEngineering-Electrical,Mechanical,Architecture,Mathematics

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0003	
Course Title: SANSKRITFORTECHNICALKNOWLEDGE	
CO-1	Understanding basic Sanskrit language.
CO-2	Ancient Sanskrit literature about science& technology can be understood.
CO-3	Being a logical language will help to develop logic in students.

SYLLABUS: VALUEEDUCATION (M19AC0004)

UNIT-I: Valuesandself-development–Socialvaluesandindividualattitudes.Workethics,Indian vision of humanism. Moral and non-moral valuation. Standards and principles.Value judgements.

UNIT-II: Importance of cultivationofvalues.Senseofduty.Devotion,Self-reliance.Confidence, Concentration. Truthfulness Cleanliness. Honesty, Humanity. Power of faith, National Unity, Patriotism, Love fornature, Discipline

UNIT-III: Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline .Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour.Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering ,love for truth. Aware of self-destructive habits. Association and Cooperation, Doing best for saving nature

UNIT-IV: Character and Competence Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality ,Non violence, Humility Role of Women. All religions and same message. Mind your Mind, Self-control .Honesty, Studying effectively.

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0004	
Course Title: VALUEEDUCATION	
CO-1	Knowledge of self-development
CO-2	Learn the importance of Human values
CO-3	Developing the overall personality

SYLLABUS: CONSTITUTION OF INDIA (M19AC0005)

UNIT-I: History of Making of the Indian Constitution: History, Drafting Committee,(Composition &Working)

UNIT-II: Philosophy of the Indian Constitution: Preamble, Salient Features

UNIT-III: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy ,Fundamental Duties

UNIT-IV: Organs of Governance: Parliament, Composition, Qualification sand Disqualifications, Power sand Functions, Executive, President , Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges ,Qualifications, Powers and Functions
Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, MayorandroleofElectedRepresentative,CEOofMunicipalCorporation,Pachayatiraj:Introduction, PRI: Zilla Panchayat. Elected officials and their roles, CEO Zilla Panchayat:Position and role. Block level: Organizational Hierarchy(Different departments),Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT-V: Election Commission: Election Commission :Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/ OBC and women.

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0005	
Course Title: CONSTITUTIONOFINDIA	
CO-1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO-2	Discuss the intellectual origins of the frame work of argument that informed the conceptualization of social reforms leading to revolution in India.
CO-3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leader ship of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
CO-4	Discuss the passage of the Hindu Code Bill of 1956.

SYLLABUS: PEDAGOGY STUDIES (M19AC0006)

UNIT-I: Introduction and Methodology: Aims and rationale, Policy background, Conceptual frame work and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.

UNIT-II: Thematic overview: Pedagogical practices are being used by teachers informal and informal class rooms in developing countries, Curriculum, Teacher education.

UNIT-III: Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.

UNIT-IV: Theoryofchange,Strengthandnatureofthebodyofevidenceforeffectivepedagogical practices Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies. Professional development: alignment with classroom practices and follow-up support

UNIT-V: Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

SYLLABUS: STRESS MANAGEMENT BY YOGA (M19AC0007)

UNIT-I: Definitions of Eight parts of yoga(Ashtanga)

UNIT-II: Yam and Niyam.
Do's and Don'ts in life.
i) Ahinsa,satya,astheya,brahmacharya and aparigraha
Shaucha, santosh, tapa, swadhyay, ishvarapranidhana

UNIT-III: Asan and Pranayam
i) Various yoga poses and their benefits for mind & body ii) Regularization of breathing techniques and its effects-Types pranayama

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0007	
Course Title: STRESSMANAGEMENTBYYOGA	
CO-1	Develop a healthy mind in a healthy body thus improving social health also.
CO-2	Improve efficiency

SYLLABUS: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS (M19AC0008)

UNIT-I: Neetisatakam-Holistic development of personality
Verses-19,20,21,22 (wisdom),Verses-29,31,32(pride & heroism)
Verses-26,28,63,65(virtue),Verses-52,53,59(don'ts),Verses-71,73,75,78(do's)

UNIT-II: Approachtodaytodayworkandduties.ShrimadBhagwadGeeta:Chapter2-Verses:41,47,48
Chapter3-Verses13,21, 27,35,Chapter6-Verses5,13,17,23,35,
Chapter18-Verses45,46,48.

UNIT-III: Statements of basic knowledge, Shrimad BhagwadGeeta:Chapter2-Verses56,62,68,
Chapter12-Verses13,14,15,16,17,18,PersonalityofRolemodel.ShrimadBhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses18,38,39,Chapter18–Verses37,38,63

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0008	
Course Title: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	
CO-1	Study of Shrimad-Bhagwad Geeta will help the student in developing his personality and achieve the highest goal in life.
CO-2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity.
CO-3	Study of Neetishatakam will help in developing versatile personality of students.

Regulation: R19										I / IV - M.Tech. II - Semester
CIVIL ENGINEERING (Under Choice Based Credit System / Elective Course System)										
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2019-20 admitted Batch onwards)										
Course Code	**Course Name**	**Category**	**Cr.**	**L**	**T**	**P**	**Int. Marks**	**Ext. Marks**	**Total Marks**	
M19ST1201	Finite Element Methods in Structural Engineering	PC	3	3	--	--	25	75	100	
M19ST1202	Theory of Plates and Shells	PC	3	3	--	--	25	75	100	
#PE-III	Program Elective-III	PE	3	3	--	--	25	75	100	
#PE-IV	Program Elective-IV	PE	3	3	--	--	25	75	100	
M19ST1209	Computer Aided Design Laboratory	PC	2	--	--	4	25	75	100	
M19ST1210	Design of Structures Laboratory	PC	2	--	--	4	2	75	100	
M19ST1211	Mini Project With Seminar	PC	2	--	--	4	100	--	100	
M19AC0005	AuditCourse-2	AC	--	2	--	--	--	--	--	
		TOTAL	**18**	**14**	**0**	**12**	**250**	**450**	**700**	

	Code	Course
#PE-III	M19ST1203	Stability of Structures
	M19ST1204	Advanced Steel Design
	M19ST1205	Analysis of Off shore Structures
#PE-IV	M19ST1206	Earth quake Resistant Design of Buildings
	M19ST1207	Structural Optimization Techniques
	M19ST1208	Earth Retaining Structures

STRUCTURAL ENGINEERING

SYLLABUS : FINITE ELEMENT METHODS IN STRUCTURAL ENGINEERING (M19ST1201)

UNIT-I: Review of stiffness method- Principle of Stationary potential energy- Potential energy of anelastic body-Rayleigh-Ritz method of functional approximation-variational approaches-weighted residual methods

UNIT-II: Finite Element formulation of truss element: Stiffness matrix-properties of stiffness matrix – Selection of approximate displacement functions-solutionofaplane truss-transformation matrix and stiffness matrix for a 3D truss-Inclined and skewed supports-Galerkin's method for1 D truss–Computation of stress in a truss element.

UNIT-III: Finite element formulation of Beam elements: Beam stiffness- assemblage of beam stiffness matrix-Examples of beam analysis for concentrated and distributed loading-Galerkin'smethod-2Darbitrarilyoriented beam element–inclined and skewed supports–rigid plane Frame examples

UNIT-IV: Finite element formulation for plane stress, plane strain and axi ymmetric problems-Derivation of CST and LST stiffness matrix and equations- treatment of body and surface forces-Finite Element solution for plane stress and axi symmetric problems-comparison of CST and LSTelements –convergence of solution-interpretation of stresses.

UNIT-V: Iso-parametric Formulation: Iso-parametric bar element-plane bilinear Iso-parametric element–quadratic plane element-shape functions, evaluation of stiffness matrix, consistent nodal load vector-Gauss quadrature-appropriate order of quadrature–element and mesh instabilities–spurious zero energy modes ,stress computation-patch test.

Course Outcomes for First Year Second Semester Course	
Course Code: M19ST1201	
Course Title: FINITE ELEMENT METHODS IN STRUCTURAL ENGINEERING	
CO-1	Apply finite element method to solve problems in solid mechanics.
CO-2	Formulate and solve problems in one dimensional structures including trusses, beams.
CO-3	Formulate finite element characteristic equations for two dimensional elements and analyze plain stress,plain strain, axi symmetric and plate bending problems.

SYLLABUS: THEORY OF PLATES AND SHELLS (M19ST1202)

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

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

UNIT-III: Introduction to Shells-Single and double curvature-Equations of Equilibrium of Shells: Derivation of stress resultants ,Principles of membrane theory and bending theory

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

UNIT-V: Beam theory of cylindrical shells: Beam and arch action. Design of diaphragms-Geometry Analysis and design of elliptic Paraboloid, Conoidal and Hyperbolic Paraboloid shapes by membrane theory.

Course Outcomes for First Year Second Semester Course	
Course Code: M19ST1202	
Course Title: THEORY OF PLATES AND SHELLS	
CO-1	Gain the knowledge of Navier‟s solution, Levy‟s solution and solve for the rectangular and square plates
CO-2	Analyze circular plates with various boundary conditions.
CO-3	Focus on the finite difference method of solving plate problems.
CO-4	Ability to realize the potential energy principle and find the solution of rectangular plates for various loadings

SYLLABUS: STABILITY OF STRUCTURES (M19ST1203)

UNIT-I: Beam columns: Beams column with a concentrated lateral load – Beams column with a uniformly distributed latera load-Beams column with end moments lateral load Superposition of Solutions – simply supported Beam column- Differential equation for beam columns-Fixed-Fixed beam column with concentrated load at mid-span-Fixed-Fixed beam column with Uniformly distributed loads.

UNIT-II: Elastic buckling of columns: Method of Neutral Equilibrium- Critical load of the Euler Column- Boundary Conditions Effective-Length Concept and design Curve – Higher –Order Differential Equation for Columns- The Behavior of Imperfect Columns- Initially Bent columns-Eccentrically loaded columns–Effect of shear for eon critical load–

In-elastic buckling of Columns-Tangent modulus theory-Double modulus theory Shanley's theory of in elastic column behaviour.

UNIT-III: ApproximateMethodsofAnalysis: Conservationofenergyprinciples,Calculationof critical loads using approximate deflection curve, Principle of stationary potential energy, Raleigh-Ritz method, Buckling load of column with variable cross section,Galerkin'smethod,Calculationofcriticalloadbyfinitedifferences.

UNIT-IV: Buckling of Frames: Introduction-Mode of Buckling-Elastic Critical Load of Frame Using Neutral Equilibrium-Elastic Critical Load of Frame Using Slope- deflection Equations- Elastic Critical Load of Frame Using Matrix Analysis.

UNIT-V: Torsional Buckling: Pure Torsion of Thin Walled Bars Open Cross Section–Non Uniform Torsion of Thin Walled Bars of Open Cross Section-Torsional buckling–Buckling of Torsion and Flexure. **Lateral Buckling of Beams:** Lateral Buckling of Simply Supported Rectangular Beams of Cross Section subjected for Pure Bending, Lateral Buckling of I- Section subjected to Pure Bending

Course Outcomes for First Year First Semester Course	
Course Code: M19ST1203	
Course Title: STABILITY OF STRUCTURES	
CO-1	Analyze different types of structural instabilities
CO-2	Execute and workout the inelastic buckling using various methodologies.
CO-3	Examine the behavior of beam columns and frames with and with outsides way using classical and stiffness methods
CO-4	To be well versed in the lateral buckling, torsional buckling, Flexural torsional buckling of various beams and non-circular sections.

SYLLABUS: ADVANCED STEEL DESIGN (M19ST1204)

UNIT-I: Simple Connections–Riveted, Bolted Pinned And Welded Connections: Riveted Connections – Bolted Connections –Load Transfer Mechanism – Failure of Bolted Joints –Specifications for Bolted Joints – Bearing – Type Connections – Tensile Strength of Plate –Strength and Efficiency of the Joint–Combined Shear and Tension–Slip-Critical connections – Prying Action – Combined Shear and Tension for Slip-Critical Connections.DesignofGrooveWelds-DesignofFilletWelds–DesignofIntermittentFilletWelds– Failure of Welds.

UNIT-II: Plastic Analysis: Introduction – Plastic Theory – Plastic neutral Axis plastic moment, Elastic & Plastic Section moduli - shape factors plastic Hinge – Fundamental condition condition simplistic analysis, methods of plastic analysis–collapse load–simply supported, propped cantilever beam, fixed beams continuous beams, portal frame singl bay single storey portal frame at different level subjected to vertical and horizontal loads.

UNIT-III: Eccentric And Moment Connections: Introduction – Beams – Column Connections – ConnectionsSubjectedtoEccentricShear–BoltedFramedConnections–BoltedSeatConnections Bolted Bracket Connections. Bolted Moment Connections–Welded Framed Connections-Welded Bracket Connections–Moment Resistant Connections.

UNIT-IV: Analysis And Design Of Industrial Buildings: Dead loads, live load sand wind loads on roofs. Design wind speed and pressure, wind pressure on roofs ;wind effect on cladding and louvers;Designofangularrooftruss,tubulartruss,trussforarailwayplatform.Designof purlins for roofs, design of built up purlins, design of knee braced trusses and stanchions. Designofbracings.

UNIT-V: Design Of Steel Truss Girder Bridges: Types of truss bridges, component parts of a truss bridge, economic Proportions of trusses, self-weight of truss girders, design of bridge Compression members, tension members; wind load on truss girder Bridges; wind effect on to plateral bracing; bottom lateral bracing; portal Bracing; sway bracing Design of Lacing.

Course Outcomes for First Year Second Semester Course	
Course Code: M19ST1204	
Course Title: ADVANCED STEEL DESIGN	
CO-1	The learner will be able to design different connections in steel structures
CO-2	The learner will be able to apply concepts of plastic analysis and design for beams And frames
CO-3	The learner will be able to Design of purlins for roofs and Design Of Steel Truss Girder Bridges

SYLLABUS: ANALYSIS OF OFF SHORE STRUCTURES (M19ST1205)

UNIT-I: Introduction to different types of off shore structures, Concept of fixed, compliant and floating structures, Law of floatation, fluid pressure and centre of pressure, estimation of centre of gravity, hydrostatic particulars, stability criteria of floating bodies, and motions ofafloatingbody.

UNIT-II: Conservation mass and momentum, Euler equation, Bernoulli's Equation, Potential low, Classification of waves, small amplitude or Linear Airy"s theory, dispersion relationship,waterparticlekinematics,waveenergy.

UNIT-III: Wave force estimation- Wave force on small bodies-Moris on equation, Estimation of Wave force on a vertical cylinder, Force due to current, Effect of marine growthonverticalcylinders.

UNIT-IV: Wave force on large bodies-Froude-krylov theory, Diffraction theory.

UNIT-V: Static and dynamicanalysisoffixedoffshorestructures.

Course Outcomes for First Year Second Semester Course	
Course Code: M19ST1205	
Course Title: ANALYSIS OF OFF SHORE STRUCTURES	
CO-1	Perform concept development of off-shore structure
CO-2	Find the wave force on vertical cylinder
CO-3	Perform static and dynamic analysis of fixed offshore structure

SYLLABUS: EARTH QUAKE RESISTANT DESIGN OF BUILDINGS (M19ST1206)

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

UNIT-II: Seismic design concepts–EQ load on simple building–load path–floor and roof diaphragms–seismic resistant building architecture–plan configuration–vertical configuration – pounding effects – mass and stiffness irregularities – torsion in structural system- Provision of seismic code (IS 1893 & 13920) – Building system – frames – shear wall– braced frames – layout design of Moment Resisting Frames(MRF) – ductility of MRF–Infill wall–Non- structural elements

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

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

UNIT-V: Retrofitting and restoration of buildings subjected to damage due to earthquakes- effects of earthquakes – factors related to building damages due to earthquake- methods of seismicretrofitting-restorationofbuildings

Course Outcomes for First Year Second Semester Course	
Course Code: M19ST1206	
Course Title: EARTH QUAKE RESISTANT DESIGN OF BUILDINGS	
CO-1	Determine the natural frequency of a single degree of freedom dynamic system for given mass, stiffness and damping properties.
CO-2	Determine the maximum dynamic response of an elastic vibrating structure to a given forcing function
CO-3	Determinethestaticdesignbaseshearbasedonthetypeofstructuralsystem, irregularity, location and occupancy.
CO-4	Distributethestaticbasesheartothestructurebasedonverticaldistributionof mass horizontal distribution of mass, and center so frigidity.
CO-5	Recognizespecialconditionssuchasirregularbuildings,buildingseparation,P-delta

SYLLABUS: STRUCTURAL OPTIMIZATION TECHNIQUES (M19ST1207)

UNIT-I: Need and scope for optimization – statements of optimization problems-Objective functionanditssurfacedesignvariables-constraintsandconstraintsurface Classification of optimization problems various functions (continuous, discontinuous and discrete) and function behavior (monotonic and unimodal)

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

UNIT-III: Non-Liner programming: Unconstrained minimization- Fibonacci, golden search, Quadratic and cubic interpolation methods for a one dimensional minimization and uni variate method,Powel’smethod,Newton’s method and Davidon Fletcher Powell’s method for multivariable optimization-Constrained minimization-Cutting plane method-Zoutendjik’s method-penalty function methods

UNIT-IV: Linear programming: Definitions and theorems-Simplex method-Duality in Linear programming-Plastic analysis and Minimum weight design and rigid frame

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

Course Outcomes for First Year Second Semester Course	
Course Code: M19ST1207	
Course Title: STRUCTURAL 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 quality or inequality constraints : solution by method of Lagrange Multiplier Applications in structural engineering, Kuhn-Tucker conditions.

SYLLABUS: EARTH RETAINING STRUCTURES (M19ST1208)

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

UNIT-II: Retaining walls–different types-Type of Failures of Retaining Walls–Stability requirements–Drainage behind Retaining walls–Provision of Joints–Relief Shells.

UNIT-III: Reinforced Soil Retaining Walls–Reinforced soil-Different components–their functions–Design principles of reinforced soil retaining walls.

UNIT-IV: Sheet Pile Structures–TypesofSheetpiles–Cantileversheetpilesinsandsandclays–Anchoredsheetpiles–FreeearthandFixedearthsupportmethods–Rowe'smoment Reduction method– Location of anchors and Design of Anchorage system.

UNIT-V:Braced cuts and Cofferdams–Lateral Pressure in Braced cuts–Design of Various Components of a Braced cut – Stability of Braced cuts – Bottom Heave in cuts. – types of cofferdam, suitability, merits and demerits – Design of single – wall cofferdams and their stability aspects–TV Amethod and Cummins"methods.

Course Outcomes for First Year Second Semester Course	
Course Code: M19ST1208	
Course Title: EARTHRETAININGSTRUCTURES	
CO-1	Solveforearthpressureexertedbysoilonretainingwallsusingearthpressure theories.
CO-2	Analyze the stability of conventional retaining walls.
CO-3	Design reinforced soil wall using the concept to frein forced soil.
CO-4	Analyze the stability of sheet pile walls.
CO-5	Design various components of braced cuts and cofferdams.

SYLLABUS: COMPUTERAIDEDDESIGNLABORATORY (M19ST1209)

1. Programming for beams subject to different loading
2. Analysis and Design of reinforced concrete multistoried building
3. Analysis of plane and spacetruss
4. Analysis of plane and space frame
5. Determination of mode shapes and frequencies of tall buildings using lumped
   Mass (stick model) approximation
6. Wind Analysis on tall structures
7. Dynamic analysis of Multistory structures

Course Outcomes for First Year Second Semester Course	
Course Code: M19ST1209	
Course Title: COMPUTER AIDED DESIGN LABORATORY	
CO-1	Develop Computer Programs for Analysis and Design of various Structural Elements
CO-2	Use different Structural Engineering software's to solve various civil Engineering programs

SYLLABUS: DESIGN OF STRUCTURES LABORATORY (M19ST1210)

1. Design of Folded Plates
2. Design of blastresistant structures
3. Design of berth structures
4. Elevated Service Reservoirs
5. Bowstring girderbridge
6. Balanced cantileve r bridge
7. Design of Piles and pile caps

Course Outcomes for First Year First Semester Course	
Course Code: M19ST1210	
Course Title: DESIGN OF STRUCTURES LABORATORY	
CO-1	To design the Folded Plates, blast resistant structures and berth structures
CO-2	To design the Bow string girder bridge and Balanced cantilever bridge

SYLLABUS: MINI PROJECT WITH SEMINAR (M19ST1211)

MINI PROJECT WITH SEMINAR

ForMiniProjectwithSeminar,astudentunderthesupervisionofafacultymember,shallcollectthe literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Project Review Committee consisting of Head of the Department, supervisor/mentorand two other senior faculty members o the department. For Mini Project with Seminar, there will be only internal evaluation of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

Regulation: R19	**II / IV - M.Tech. I - Semester**

STRUCTURAL ENGINEERING
(Under Choice Based Credit System / Elective Course System)

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2019-20 admitted Batch onwards)

Course Code	Course Name	Category	Cr.	L	T	P	Int. Marks	Ext. Marks	Total Marks
#PE-V/MOOCS	Program Elective-V/MOOCS	PE	3	3	--	--	25	75	100
#OE-I/MOOCS	Open Elective-I/MOOCS	OE	3	3	--	--	25	75	100
M19ST2106	Dissertation-I /Industrial Project	PR	10	0	--	20	50	50	100
TOTAL			**16**	**6**	**--**	**20**	**200**	**200**	**300**

	Course Code	Course
#PE-V/MOOCS	M19ST2101	Design of Pre-stressed Concrete Structures
	M19ST2102	Reliability Analysis and Design
	M19ST2103	Industrial Structures
	M19 ST 2104(MOOCS-I)	Students Going for Industrial Project/Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a12weeks'course duration in PG level with 3credits,but The chosen subject should not be covered in their M. Tech Course
#OE-I/MOOCS	#OE-I	Students have to choose one open elective course offered by departments other than the parent department. List of open Electives offered by other departments are enclosed.
	M19 ST 2105(MOOCS-II)	Students Going for Industrial Project/Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a12weeks'course duration in PG level with 3credits,but The chosen subject should not be covered in their M. Tech Course

OPEN ELECTIVE SOFFERED TO OTHER DEPARTMENTS	
M19ST2107	Construction Management
M19ST2108	Green Technology
M19ST2109	Analysis of Off shore Structures

STRUCTURAL ENGINEERING

SYLLABUS :DESIGN OF PRE-STRESSED CONCRETE STRUCTURES (M19ST2101)

UNIT-I : Prestressing Systems – Pretensioning Systems – Postensioning Systems – High Strength Steel and Concrete - Analysis of Prestress - Resultant Stresses at a Section – Pressure Line or Thrust Line – Concept of Load Balancing - Losses of Prestress – Loss Due to Elastic Deformation of Concrete – Shrinkage of Concrete – Creep – Relaxation of Stress in Steel –Friction–Anchorage Slip.

UNIT-II : DEFLECTIONS OF PRESTRESSED CONCRETE MEMBERS: Importance of Control of Deflections–FactorsInfluencingDeflection–Short-termDeflectionsofUncrackedMembers–PredictionofLong-timeDeflections–DeflectionsofCrackedMembers–RequirementsofIS1343-2012.

ULTIMATE FLEXURAL STRENGTH OF BEAMS: Introduction, Flexural theory using first principles–Simplified Methods–Ultimate Moment of Resistance of untensioned Steel.

UNIT-III:COMPOSITECONSTRUCTIONS: Introduction,Advantages,TypesofCompositeConstruction, Analysis of Composite beams- Differential shrinkage- Ultimate Flexural and shear strength of composite sections- Deflection of Composite Beams. Design of Composite sections.

UNIT-IV: PRESTRESSED CONCRETES LABS : Types Of Prestressed Concrete Floor Slabs-Design of Prestressed Concrete One Way and Two Way Slabs. **Prestressed Concrete Pipes and Poles:** Circular prestressing –Types of Prestressed Concrete Pipes-Design of Prestressed Concrete Pipes-Prestressed Concrete Poles.

UNIT-V: CONTINUOUS BEAMS: Advantage of Continuous Members – Effect of Prestressing Inderterminate Structures – Methods of Achieving Continuity – Methods of Analysis of Secondary Moments – Concordant Cable Profile – Guyon"s Theorem. Redistribution of moments in a continuous beam.

Anchorage Zone Stresses in Beams: Introduction, Stress distribution in End Block –Anchoragezonestresses–Magnel"smethod-Guyon"sMethod-AnchoragezoneReinforcement.

Course Outcomes for Second Year First Semester Course	
Course Code: M19ST2101	
Course Title: DESIGN OF PRE-STRESSED CONCRETE STRUCTURES	
CO-1	Explain the principle, types and systems of prestressing and analyze the deflections.
CO-2	Determine the flexural strength and design the flexural members, end blocks.
CO-3	Analyze the statically indeterminate structures and design the continuous beam.
CO-4	Design the tension and compression members and apply it for design of piles.
CO-5	Analyze the stress, deflections, flexural and shear strength and apply it for the design of bridges.
CO-6	Analyze the Composite construction of Pre-stressed and in-situ concrete.

SYLLABUS: RELIABILITY ANALYSIS AND DESIGN (M19ST2102)

UNIT-I: 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..

UNIT-II: 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..

UNIT-III: 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.

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

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

Course Outcomes for Second Year First Semester Course	
Course Code: M19ST2102	
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.

SYLLABUS: INDUSTRIAL STRUCTURES (M19ST2103)

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

UNIT-II: 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,

UNIT-III: 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.

UNIT-IV: 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.

UNIT-V: Industrial buildings-roofs for industrial buildings (Steel)- design of gantry girder-design of corbel sand nibs- machine foundations

Course Outcomes for Second Year First Semester Course	
Course Code: M19ST2103	
Course Title: INDUSTRIAL STRUCTURES	
CO-1	Plan the functional requirements of structural systems for various industries.
CO-2	Get an idea about the materials used and design of industrial structural elements.
CO-3	Design power transmission structures.
CO-4	Possesstheabilitytounderstandthedesignconceptsofdesignofgantrygirder

SYLLABUS: MOOCS-I (M19ST2104)

Students Going for Industrial Project / Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a 12 weeks' course duration in PG level with 3 credits, but the chosen subject should not be covered in their M. Tech Course

OPENELECTIVE

Offered from	Course Code	Course Name	Offered to
COMPUTERSCIENCE&ENGINEERING	M19CST2106	Python Programming	**ST, CS, PSA &CAD/CAM**
	M19CST2107	Artificial Intelligence	
	M19CST2108	Advanced Data structures	
ELECTRONICS& COMMUNICATIONENGINEERING	M19 CS2107	Signals and systems	**ST,CST,PSA, IT &CAD/CAM**
	M19 CS2108	Principles of Communication	
	M19 CS2109	Image and video Processing	
ELECTRICAL &ELECTRONICSENGINEERING	M19PS2107	Electric And Hybrid Vehicles	**ST,CST,CS, IT &CAD/CAM**
	M19PS2108	Energy From Waste	
	M19PS2109	Energy Management and Auditing	
INFORMATIONTECHNOLOGY	M19IT2108	Web Technologies	**ST, CS, PSA &CAD/CAM**
	M19IT2109	Internet of Things	
	M19IT2110	Machine Learning	
MECHNAICALENGINEERING	M19CAD2107	Operations Research	**ST, CST, CS,PSA &IT**
	M19CAD2108	Nano Technology	
	M19CAD2109	Product Design &Manufacturing	
SCIENCE &HUMANITIES	M19BS2101	Management and Organisational Behaviour	**ST, CST, CS,PSA, IT &CAD/CAM**

SYLLABUS: MOOCS-II (M19ST2105)

Students Going for Industrial Project / Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a 12 weeks' course duration in PG level with 3 credits, but the chosen subject should not be covered in their M. Tech Course

SYLLABUS: DISSERTATION-I/INDUSTRIAL PROJECT (M19ST2106)

The Student has to register for Dissertation-I / Industrial project in III semester. Student has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work for approval. The student can initiate the Project work, only after obtaining the approval from the Project Review Committee (PRC).

Continuous assessment of Dissertation-I during the III-Semester will be monitored by the PRC.

Dissertation-I/ Industrial Project is evaluated for 50 internal marks and 50 external marks.

Internal marks 50 awarded by Project Guide and PRC jointly based on continuous assessment consisting of two seminars based on Dissertation work-I.

External marks 50 awarded by External Examiner, Supervisor and Head of the Department jointly based on a review and Viva voce on Dissertation work-I

Regulation: R19							II / IV - B.Tech. II - Semester		
STRUCTURAL ENGINEERING (Under Choice Based Credit System / Elective Course System)									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2019-20 admitted Batch onwards)									
Course Code	**Course Name**	**Category**	**Cr.**	**L**	**T**	**P**	**Int. Marks**	**Ext. Marks**	**Total Marks**
M19ST2201	Dissertation-II /Industrial Project	PR	16	0	0	32	--	100	100

STRUCTURAL ENGINEERING

SYLLABUS : DISSERTATION-II/INDUSTRIAL PROJECT (M19ST2201)

The student has to continue his/her work from Dissertation-I / Industrial project to complete Dissertation-II in IV semester.

Continuous assessment of Dissertation-II during IV-Semester will be monitored by the PRC.

Dissertation-II is evaluated for 100 external marks based on Review and Viva Voce.

Review and Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the Thesis. The Board shall jointly report the candidate's work for 100 marks.

If the report of the Viva-Voce is unsatisfactory (ie, < 50 marks), the candidate shall retake the Viva-Voce examination only after three months. If he fails to get a satisfactory report at the second Viva-Voce examination, the candidate has to reregister for the project and complete the project within the stipulated time after taking the approval from the College.

Regulation: R19	I / II - M.Tech. I - Semester

COMPUTER SCIENCE & TECHNOLOGY
(Under Choice Based Credit System / Elective Course System)

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2019-20 admitted Batch onwards)

Course Code	Course Name	Category	Cr.	L	T	P	Int. Marks	Ext. Marks	Total Marks
M19 CST1101	Mathematical Foundations of Computer Science	PC	3	3	0	0	25	75	100
M19 CST 1102	Advanced Data Structures	PC	3	3	0	0	25	75	100
#PE-I	Program Elective-I	PE	3	3	0	0	25	75	100
#PE-II	Program Elective-II	PE	3	3	0	0	25	75	100
M19 RD 1101	Research Methodology and IPR	CC	2	2	0	0	25	75	100
M19 CST 1113	Advanced Data Structures Lab	PC	2	0	0	4	25	75	100
M19 CST 1114	Computing Lab	PC	2	0	0	4	25	75	100
#AC-1	Audit course -1	AC	0	2	0	0	0	0	0
TOTAL			**18**	**16**	**0**	**8**	**175**	**525**	**700**

	Code	Course		Code	Course
#PE-I	M19CST1103	Artificial Intelligence	**# AC 1 & 2**	M19AC0001	English for Research Paper Writing
	M19CST1104	Cloud Computing		M19AC0002	Disaster Management
	M19CST1105	Digital Image Processing		M19AC0003	Sanskrit for Technical Knowledge
	M19CST1106	Advanced Operating System		M19AC0004	Value Education
	M19CST1107	Optimization Techniques		M19AC0005	Constitution of India
#PE-II	M19CST1108	Bigdata Analytics		M19AC0006	Pedagogy Studies
	M19CST1109	Applied Cryptography		M19AC0007	Stress Management by Yoga
	M19CST1110	Advanced Computer Networks		M19AC0008	Personality Development throughLife Enlightenment Skills.
	M19CST1111	Embedded Computing			
	M19CST1112	Parallel Computer Architecture			

COMPUTER SCIENCE & TECHNOLOGY

SYLLABUS : MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (M19CST1101)

UNIT-I : Review on basic Probability concepts- sample space -Addition and Multiplication theorems- Bay's theorem- Random variables (Discrete & Continuous).

Probability mass, density and cumulative distribution functions(for discrete & continuous random variables)- Joint distribution function- discrete & continuous random variables-conditional distribution- Expected value, Variance- Conditional expectation- Central limit theorem, probabilistic inequalities- Chebychev's inequality, Jenson's inequality- Cauchy – Schwartz inequatility- Convergence in probability- Markov chains.

UNIT-II : Parametric families of distributions: Binomial, Poisson, Normal, Uniform, exponential And Gamma distribution, derivation of basic characteristics, Hypergeomentric &multinomial distributions.

UNIT-III: Statistical inference, introduction to multivariate Statistical models: Scatter diagram, fitting of straight line, parabola, power and exponential curves: ax^b , ab^x , ae^{bx} using method of least square approximation, multiple regression (linear equations)- principal component analysis.

Random Samples: Sampling distributions of Estimators, efficient and unbiased estimation, point & interval estimator: Method of moments and maximum likelyhood estimator.

UNIT-IV: Graph Theory: Isomorphism, Planar graphs, Euler's and Hamiltonian circuits or Euler'scycles: graph coloring- Choramotic number.

Trees: Introduction- Trees- Labeled tree- some diagrams on directed and undirected trees, Review of Basic properties of a tree- Sequential representation of a binary tree.

UNIT-V: Counting Methods: Permutation & Combination with & without repetition: Principalinclusion & exclusion: Specials technique to solve combinational enumerator problem: **Recurrence relation**: order & degree of recurrence relation, Solution of Linearhomogeneous and non- homogeneous recurrence relation with constant coefficient using methods of generating function, characteristic roots & particular solution by method of determinant coefficients..

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1101	
Course Title: MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	
CO-1	To understand the basic notions of discrete and continuous probability.
CO-2	To understand the methods of statistical inference, and the role that sampling distributions play in those methods.
CO-3	To be able to perform correct and meaningful statistical analyses of simple to moderate complexity.
CO-4	Fit a best suitable curve for the given data
CO-5	Utilize the concepts in graph theory in their field.
CO-6	Solve different counting problems as well as recurrence relations.

SYLLABUS: ADVANCED DATA STRUCTURES (M19CST1102)

UNIT-I: Dictionaries: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries. **Hashing:** Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing,
Rehashing, Extendible Hashing.

UNIT-II: Skip Lists: Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists

UNIT-III: Trees: Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees

UNIT-IV: Text Processing: Sting Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix
Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem(LCS), Applying Dynamic Programming to the LCS Problem.

UNIT-V: Computational Geometry: One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quad trees, k- D Trees. Recent Trends in Hashing, Trees, and various computational geometry methods for efficiently solving the new evolving problem stochastic process in manufacturing, Game theory

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1102	
Course Title: ADVANCED DATA STRUCTURES	
CO-1	Understand the implementation of symbol table using hashing techniques.
CO-2	Understand the implementation of skip lists and Need for Randomizing Data Structure
CO-3	Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
CO-4	Develop algorithms for text processing applications.
CO-5	Identify suitable data structures and develop algorithms for computational geometry problems.

SYLLABUS: ARTIFICIAL INTELLIGENCE (M19CST1103)

UNIT-I: Introduction to artificial intelligence: Introduction , history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI,
Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative- deepening a*, constraint satisfaction.

UNIT-II: Problem reduction and game playing: Introduction, problem reduction, game playing, alpha- beta pruning, two-player perfect information games, **Logic concepts:** Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

UNIT-III: Knowledge representation: Introduction, approaches to knowledge representation,
knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames, **advanced knowledge representation techniques:** Introduction, conceptual dependency theory, script structure, cyc theory, case grammars, semantic web, **Expert system and applications:** Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools.

UNIT-IV: Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-shafer theory , **Fuzzy sets and fuzzy logic:** Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

UNIT-V: Machine learning paradigms: Introduction, machine learning systems, supervised and unsupervised learnings, inductive learning, deductive learning, clustering, support vector machines, case based reasoning and learning, **Artificial neural networks:** Introduction, artificial networks, single layer feed forward networks, multi layered forward networks, design issues of artificial neural networks

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1103	
Course Title: ARTIFICIAL INTELLIGENCE	
CO-1	Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents
CO-2	Analyze and formalize the problem as a state space, graph, design heuristics andselect amongst different search or game based techniques to solve them.
CO-3	Develop intelligent algorithms for constraint satisfaction problems and also designintelligent systems for Game Playing
CO-4	Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.
CO-5	Solve problems with uncertain information using Bayesian approaches.

SYLLABUS: CLOUD COMPUTING (M19CST1104)

UNIT-I: History of Centralized and Distributed Computing, Overview of Distributed Computing, Cluster computing, Grid computing. Technologies for Network based systems, System models for Distributed and cloud computing, Software environments for distributed systems and clouds.

UNIT-II: Introduction to Cloud Computing, Cloud issues and challenges, Properties, Characteristics, Service models, Deployment models. Cloud resources: Network and API, Virtual and Physical computational resources, Data-storage. Virtualization concepts, Types of Virtualization: Introduction to Various Hypervisors, High Availability (HA)/Disaster Recovery (DR) using Virtualization, Moving VMs.

UNIT-III: Service models, Infrastructure as a Service (IaaS), Resource Virtualization: Server, Storage, Network, Case studies. Platform as a Service (PaaS), Cloud platform & Management: Computation, Storage, Case studies. Software as a Service (SaaS), Web services, Web 2.0, Web OS, Case studies, Anything as a service (XaaS).

UNIT-IV: Cloud Programming and Software Environments, Parallel and Distributed Programming paradigms, Programming on Amazon AWS and Microsoft Azure, Programming support of Google App Engine, Emerging Cloud software Environment.

UNIT-V: Cloud Access: authentication, authorization and accounting, Cloud Provenance and meta-data, Cloud Reliability and fault-tolerance, Cloud Security, privacy, policy and compliance, Cloud federation, interoperability and standards..

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1104	
Course Title: : CLOUD COMPUTING	
CO-1	Articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing.
CO-2	Use and Examine different cloud computing services
CO-3	Identify the appropriate cloud platform and software environment for the given application.
CO-4	Explain the core issues of cloud computing such as security, privacy, and interoperability.

SYLLABUS: DIGITAL IMAGE PROCESSING (M19CST1105)

UNIT-I: Digital Image Fundamentals: Image Formation and types, Basic geometric transformations, Fourier Transforms, Walsh, Hadamard, Discrete Cosine, HotellingTransforms.

UNIT-II: Image Enhancement and Restoration: Histogram Modification Techniques, Image Smoothening, Image Sharpening, Image Restoration, Degradation Model, Noise Models, Spatial Filtering, Frequency Domain Filtering.

UNIT-III: Image Segmentation and Recognition: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Based Segmentation, Morphology operations. Pattern classification, Clustering and Matching, Knowledge representation and use for scene analysis and image understanding (2D and 3D),Object recognition and identification, Case study of various applications

UNIT-IV: Pattern Recognition: Key concepts, Supervised/Unsupervised Learning, Loss functions and generalization, Probability Theory, Parametric VS Non-parametric methods, Elements of Computational Learning Theory Ensemble Learning, Bagging, Boosting, Random Forest

UNIT-V: Dimensionality Reduction - CCA, LDA, ICA, NMF - Canonical Variates – Feature Selection vs Feature Extraction, Filter Methods - Sub-space approaches - Embedded methods, Low-Rank approaches - Recommender Systems

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1105	
Course Title: DIGITAL IMAGE PROCESSING	
CO-1	Students are able to develop software tools such as Games, Animation, and Recognition system.
CO-2	Key concepts, tools and approaches for pattern recognition on complex datasets.

SYLLABUS: ADVANCED OPERATING SYSTEMS (M19CST1106)

UNIT-I: Multiprocessor Operating Systems: System Architectures, Structures of OS, OS design issues, Process synchronization, Process Scheduling and Allocation, memory management.

UNIT-II: Distributed Operating Systems: System Architectures, Design issues Communication models, clock synchronization, mutual exclusion, electionalgorithms, Distributed Deadlock detection

UNIT-III: Database Operating Systems: Requirements of Database OS, Transaction process model, Synchronization primitives, Concurrency control algorithms.

UNIT-IV: Plate girder bridges - Elements of plate girder and their design-web-flange -intermediate stiffener- vertical stiffeners- bearing stiffener- Design problem.

UNIT-V: Mobile Operating Systems: ARM and Intel architectures, Power Management, Mobile OS Architectures, Underlying OS, Kernel structure and native level programming, Runtime issues, Approaches to power management.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1106	
Course Title: ADVANCED OPERATING SYSTEMS	
CO-1	Knowledge about advanced concepts in OS
CO-2	Ability to develop OS for distributed systems
CO-3	Ability to develop modules for mobile devices

SYLLABUS: OPTIMIZATION TECHNIQUES (M19CST1107)

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

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

UNIT-III: Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

UNIT-IV:

Scheduling and sequencing - single server and multiple server models – deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

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

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1107	
Course Title: OPTIMIZATION TECHNIQUES	
CO-1	Students should able to apply the dynamic programming to solve problems ofdiscreet and continuous variables.
CO-2	Students should able to apply the concept of non-linear programming
CO-3	Students should able to carry out sensitivity analysis
CO-4	Student should able to model the real world problem and simulate it.

SYLLABUS: BIG DATA ANALYTICS (M19CST1108)

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

UNIT-II: Working with Big Data: Google File System, Hadoop Distributed File System (HDFS), Building blocks of Hadoop (Name node, Data node, Secondary Name node, Job Tracker,
Task Tracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

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

UNIT-IV: Hadoop I/O: The Writable Interface, Writable Comparable and comparators, **Writable Classes:** Writable wrappers for Java primitives, Text, Bytes Writable, Null Writable, Object Writable and Generic Writable, Writable collections, Implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom comparators

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

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1108	
Course Title: BIG DATA ANALYTICS	
CO-1	Understand the programming requirements viz., generic types and methods toperform data analysis
CO-2	Understand the existing technologies and the need of distributed files systems toanalyze the big data
CO-3	To understand and analyze Map-Reduce programming model for better optimization
CO-4	Collect, manage, store, query, and analyze big data; and identify the need of interfaces to perform I/O operations in Hadoop
CO-5	Identify the need based tools, viz., Pig and Hive and to handle
CO-6	Formulate an effective strategy to implement a successful Data analytics project

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SYLLABUS: APPLIED CRYPTOGRAPHY (M19CST1109)

UNIT-I: Foundations, Protocol Building Blocks, Basic Protocols, Advanced Protocols - Zero- Knowledge Proofs, Zero-Knowledge Proofs of Identity, Blind Signatures, Identity-Based Public- Key Cryptography, Key Length, Key Management, Electronic Codebook Mode, Block Replay, Cipher Block Chaining Mode, Stream Ciphers, Self-Synchronizing Stream Ciphers, Cipher- Feedback Mode, Synchronous Stream Ciphers, Output-Feedback Mode, Counter Mode, Other Block-Cipher Modes, Choosing a Cipher Mode.

UNIT-II: Information Theory, Complexity Theory, Number Theory, Factoring, Prime Number Generation, Discrete Logarithms in a Finite Field, Data Encryption Standard (DES), IDEA, CAST, Blowfish, RC5, Double Encryption, Triple Encryption.

UNIT-III: Pseudo-Random-Sequence Generators and Stream Ciphers- Linear Congruential Generators, Linear Feedback Shift Registers, Stream Ciphers using LFSRs, RC4, Feedback with Carry Shift Registers, Stream Ciphers Using FCSRs, Nonlinear-Feedback Shift Registers, Other Stream Ciphers, One-Way Hash Functions-MD5, Secure Hash Algorithm (SHA), One Way Hash Functions Using Symmetric Block, Using Public Key Algorithms, Message Authentication Codes.

UNIT-IV: Public-Key Algorithms, Knapsack Algorithms, RSA, Rabinm ElGamal, Elliptic Curve Cryptosystems, Digital Signature Algorithm (DSA), DSA Variants, Gost Digital Signature Algorithm, Discrete Logarithm Signature Schemes, Ong-Schnorr-Shamir, Schnorr, Converting Identification Schemes to Signature Schemes.

UNIT-V: Diffie- Hellman, Station-to-Station Protocol, Multiple-Key Public-Key Cryptography, Subliminal Channel, Undeniable Digital Signatures, Designated Confirmer Signatures, Kerberos, Privacy-Enhanced Mail (PEM), Message Security Protocol (MSP), Pretty Good Privacy (PGP), Smart Cards, Public-Key Cryptography Standards (PKCS).

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1109	
Course Title: APPLIED CRYPTOGRAPHY	
CO-1	Demonstrate the basics of Cryptographic protocols
CO-2	Explain the concepts of Stream Ciphers and Public Key Encryption
CO-3	Demonstrate Number Theory for Symmetric and Asymmetric Ciphers anddiscuss various Ciphers
CO-4	Discuss Hashing Algorithms and Message Authentication Codes
CO-5	Discuss Key-Exchange algorithms and Real world Implementations

SYLLABUS: ADVANCED COMPUTER NETWORKS (M19CST1110)

UNIT-I: Network layer: Network Layer design issues: store-and forward packet switching, services provided transport layers, implementation connection less services, implementation connection oriented services, comparison of virtual –circuit and datagram subnets. **Routing Algorithm** –shortest path routing, flooding, distance vector routing, link state routing, Hierarchical routing, Broadcast routing, Multicasting routing, routing for mobiles Hosts, routing in Adhoc networks-**congestion control algorithms**-Load shedding, Congestion control in Datagram Subnet.

UNIT-II: IPV4 Address: Address space, notations, classful addressing, classless addressing network addressing translation (NAT), **IPV6 Address structure** address space, **Internetworking** need for network layer internet as a data gram, internet as connection less network. **IPV4** datagram, Fragmentation, checksum, options. **IPV6** Advantages, packet format, extension Headers, Transition form IPV4 to IPV6

UNIT-III: Process to process delivery: client/server paradigm, multiplexing and Demultiplexing, connectionless versus connection oriented services, reliable versus reliable.**UDP:** well known ports for UDP, user data gram, check sum, UDP operation, and uses of UDP.**TCP:** TCP services, TCP features, segment, A TCP connection, Flow control, error control,congestion control. **SCTP:** SCTP services SCTP features, packet format, An SCTP association, flow control, error control.

UNIT-IV: Congestion control: open loop congestion control, closed loop congestion control, Congestion control in TCP, frame relay, **QUALITY OF SERVICE**: flow characteristics, flow classes **TECHNIQUES TO IMPROVE QOS**: scheduling, traffic shaping, resource reservation, admission control. Emerging trends Computer Networks: **Motivation for mobile computing**: protocol Stack Issues in Mobile Computing Environment, Mobility issues in mobile computing, data dissemination security issues mobile networks

UNIT-V: Domain name system: The name space, resource records, name servers **E-mail**: architecture and services, the user agent, message formats, message transfer, final delivery. **Www**: architecture overview, static web documents, dynamic web documents, hyper text transfer protocol, performance elements, the wireless web. **Multimedia:** introduction digital a audio , Audio compression, streaming audio, internet radio, voice over IP, introduction to video, video compression, video on demand, the MBone-the multicast back bone

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1110	
Course Title: ADVANCED COMPUTER NETWORKS	
CO-1	Illustrate reference models with layers, protocols and interfaces.
CO-2	Describe Sub netting and Addressing of IP V4andIPV6.
CO-3	Describe and Analysis of basic protocols of computer networks, and how they can be used to assist in network design and implementation.
CO-4	Discuss the concepts of congestion control and quality of service
CO-5	Demonstrate Data Communications System and its components.

SYLLABUS: EMBEDDED COMPUTING (M19CST1111)

UNIT-I: Programming on Linux Platform: System Calls, Scheduling, Memory Allocation, Timers, Embedded Linux, Root File System, Busy Box. Operating System Overview: Processes, Tasks, Threads, Multi-Threading, Semaphore, Message Queue.

UNIT-II: Introduction to Software Development Tools: GNU GCC, make, gdb, static and dynamic linking, C libraries, compiler options, code optimization switches, lint, code profiling tools.

UNIT-III: Interfacing Modules: Sensor and actuator interface, data transfer and control, GPS, GSM module interfacing with data processing and display, OpenCV for machine vision, Audiosignal processing.

UNIT-IV: Networking Basics: Sockets, ports, UDP, TCP/IP, client server model, socket programming, 802.11, Bluetooth, ZigBee, SSH, firewalls, network security.

UNIT-V: IA32 Instruction Set: application binary interface, exception and interrupt handling, interrupt latency, assemblers, assembler directives, macros, simulation and debugging tools.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1111	
Course Title: EMBEDDED COMPUTING	
CO-1	Describes the differences between the general computing system and the embedded computing system.
CO-2	Summarizes various software development tools like GNU, GCC etc.
CO-3	Develop interface modules for various types of sensors
CO-4	Write client server program using TCP and UDP sockets

SYLLABUS: PARALLEL COMPUTER ARCHITECTURE (M19CST1112)

UNIT-I: Fundamentals of Computer Design:

Defining Computer Architecture – Trends in Technology – Trends in Power in IntegratedCircuits– Trends in Cost – Dependability – Measuring, Reporting and Summarizing Performance – Quantitative Principles of Computer Design – Basic and Intermediate concepts of pipelining – Pipeline Hazards – Pipelining Implementation issues.

UNIT-II: Instruction-Level Parallelism and Its Exploitation:

Instruction-Level Parallelism: Concepts and Challenges – Basic Compiler Techniques for Exposing ILP – Reducing Branch Costs with Prediction – Overcoming Data Hazards with Dynamic Scheduling – Dynamic Scheduling: Algorithm and Examples – Hardware-Based Speculation – Exploiting ILP Using Multiple Issue and Static Scheduling – Exploiting ILP Using Dynamic Scheduling, Multiple Issue and Speculation – Studies of the Limitations of ILP – Limitations on ILP for Realizable Processors – Hardware versus Software Speculation – Using ILP Support to Exploit Thread-Level Parallelism

UNIT-III: Data-Level and Thread-Level Parallelism

Vector Architecture – SIMD Instruction Set Extensions for Multimedia – Graphics Processing Units – Detecting and Enhancing Loop-Level Parallelism – Centralized Shared- Memory Architectures – Performance of Shared-Memory Multiprocessors – Distributed Shared Memory and Directory Based Coherence – Basics of Synchronization – Models of Memory Consistency – Programming Models and Workloads for Warehouse-Scale Computers– Computer Architecture of Warehouse-Scale Computers –Physical Infrastructure and Costs of Warehouse-Scale Computers

UNIT-IV: Memory Hierarchy Design

Cache Performance – Six Basic Cache Optimizations – Virtual Memory – Protection and Examples of Virtual Memory – Ten Advanced Optimizations of Cache Performance – Memory Technology and Optimizations – Protection: Virtual Memory and Virtual Machines – The Design of Memory Hierarchies

UNIT-V: Storage Systems & Case Studies

Advanced Topics in Disk Storage – Definition and Examples of Real Faults and Failures – I/O Performance, Reliability Measures and Benchmarks – Designing and Evaluating an I/O System – The Internet Archive Cluster Case Studies / Lab Exercises: INTEL i3, i5, i7 processor cores, NVIDIA GPUs, AMD, ARM processor cores – Simulators – GEM5, CACTI, SIMICS, Multi2sim and INTEL Software development tools.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1112	
Course Title: PARALLEL COMPUTER ARCHITECTURE	
CO-1	Students accustomed with the representation of data, addressing modes, and instructions sets.
CO-2	Students able to understand parallelism both in terms of a single processor and multiple processors Technical knowhow of parallel hardware constructs to include instruction-level parallelism for multi core process or design

SYLLABUS: RESEARCH METHODOLOGY AND IPR (M19RD1101)

UNIT-I: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT-II: Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format ofresearch proposal, a presentation and assessment by a review committee

UNIT-III: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents,Patenting under PCT.

UNIT-IV: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT-V: New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1110	
Course Title: ADVANCED COMPUTER NETWORKS	
CO-1	Analyze research related information
CO-2	Formulate a Research Proposals and Publish papers with research ethics
CO-3	Award for Intellectual Property Rights like Patents, Trade and Copyrights
CO-4	Analyze Various Intellectual Property Rights

SYLLABUS: ADVANCED DATA STRUCTURES LAB (M19CST1114)

1. Perform various operations on AVL Trees
2. Perform various operations on BST
3. Implementation of Static Hashing
4. Implementation of Huffman coding
5. Implementation of B Tree.
6. Consider telephone book database of N clients. Make use of a hash table implementation to quickly look up clients telephone number.
7. Implement all the functions of a dictionary (ADT) using hashing. Data: Set of (key, value) pairs,Keys are mapped to values, Keys must be comparable, Keys must be unique Standard Operations: Insert(key, value), Find(key),Delete(key)
8. For given set of elements create skip list. Find the element in the set that is closest to some given value.
9. Implement KMP algorithm for Pattern Matching
10. Implement Boyer-Moore algorithm for Pattern Matching
11. Implement Naïve string matching algorithm.
12. Implement insertion, deletion, display and search operation in m-way B tree (i.e. a non- leaf node can have at most m children) for the given data as integers (Test the program for m=3, 5,7).
13. Implementation of Skip lists

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1110	
Course Title: ADVANCED COMPUTER NETWORKS	
CO-1	Develop solutions for a range of problems using object oriented programming.
CO-2	Implement complex problems using advanced data structures (like Dictionaries, Skip Lists and trees.).
CO-3	Implement operations like searching, insertion, and deletion, Traversing mechanism etc. on various data structures.
CO-4	Utilize data structures in the applications such as binary search trees, AVL and B Trees

SYLLABUS: COMPUTING LAB (M19CST1115)

Note: First SIX experiments are mandatory. Remaining experiments can be done based on the student's choice of any one specialization.

1. a) Write a python program to print the multiplication table for the given number?
   b) Write a python program to check whether the given number is prime or not?
   c) Write a python program to find factorial of the given number?
2. Write a python program to implement simple Chat bot?
3. a) Write a python program to implement List operations (Nested List, Length, Concatenation, Membership, Iteration, Indexing and Slicing)?
   b) Write a python program to implement List methods (Add, Append, Extend& Delete).
4. a) Write a python program to Illustrate Different Set Operations?
   b) Write a python program to generate Calendar for the given month and year?
   c) Write a python program to implement Simple Calculator program?
5. a) Write a python program to Add Two Matrices.
   b) Write a python program to Transpose a Matrix.
6. a) Write a python program to remove punctuations from the given string?
   b) Write a python program to sort the sentence in alphabetical order?

Artificial Intelligence Specialization:

1. Write a python program to implement Breadth First Search Traversal?
2. Write a python program to implement Water Jug Problem?
3. Write a program to implement Hangman game using python.
4. Write a program to implement Tic-Tac-Toe game
5. a) Write a python program to remove stop words for a given passage from a text file using NLTK?
   b) Write a python program to implement stemming for a given sentence using NLTK?
   c) Write a python program to POS (Parts of Speech) tagging for the give sentence using NLTK?

Big Data Specialization:

1. a) Perform setting up and Installing Hadoop in its three operating modes:Standalone, Pseudo distributed, Fully distributed
   b) Use web based tools to monitor your Hadoop setup.
2. Implement the following file management tasks in Hadoop:
   • Adding files and directories

- Retrieving files
- Deleting files

3. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
4. Write a Map Reduce program that mines weather data.
   Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with Map Reduce, since it is semi structured and record-oriented.
5. Implement Matrix Multiplication with Hadoop Map Reduce
6. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter Your data.
7. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions and indexes

Cryptography Specialization:

Exercise –1:

Write a Java program to perform encryption and decryption using the following algorithms:

a) Ceaser Cipher
b) Substitution Cipher
c) Hill Cipher

Exercise – 2:

Write a Java program to implement the 3 DES and AES algorithms.

Exercise – 3:

Write a JAVA program to implement the BlowFish algorithm

Exercise-4 :

Implement MD-5 using Java

Exercise-5:

Write a Java program to implement RSA (2048 Key Length) Algorithm.

Exercise-6:

Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript. Consider the end user as one of the parties (Alice) and the JavaScript application as other party (bob).

Exercise-7:

Calculate the message digest of a text using the SHA-2 algorithm in JAVA.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1115	
Course Title: COMPUTING LAB	
CO-1	Write programs using different python packages.
CO-2	Apply AI problem solving approaches to natural language processing.(Specialization 1)
CO-3	Organize Real time data processing using Hadoop. (Specialization 2)
CO-4	Develop different cryptography algorithms in java (Specialization 3)

SYLLABUS: ENGLISH FOR RESEARCH PAPER WRITING (M19AC0001)

UNIT-I:
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity andVagueness

UNIT-II: Clarifying Who Did What, Highlighting Your Findings, Hedging And Criticizing, Paraphrasing and Plagiarism, Sections of a Paper.

UNIT-III: Abstracts, Introduction, Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-IV: Key skills are needed when writing a Title, key skills are needed when writing an abstract,key skills are needed when writing an introduction, skills needed when writing a Review of the Literature, skills are needed when writing the Methods.

UNIT-V: Skills needed when writing the Results, skills are needed when writing the Discussion, skillsare needed when writing the Conclusions, useful phrases, how to ensure paper is as good as it could possibly be the first-time submission

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1110	
Course Title: ADVANCED COMPUTER NETWORKS	
CO-1	Understand that how to improve your writing skills and level of readability
CO-2	Learn about what to write in each section
CO-3	Understand the skills needed when writing a Title Ensure the good quality of paper at very first time submission

SYLLABUS: DISASTER MANAGEMENT (M19AC0002)

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

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

UNIT-III: Disaster Prone Areas In India: Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics.

UNIT-IV: Disaster Preparedness And Management

Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation OfRisk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

UNIT-V: Risk Assessment

Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

Disaster Mitigation

Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0002	
Course Title: DISASTER MANAGEMENT	
CO-1	Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO-2	Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO-3	Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO-4	Critically understand the strengths and weaknesses of disaster management approaches, planning & programming in different countries, particularly their home country or the countries they work in.

SYLLABUS: SANSKRIT FOR TECHNICAL KNOWLEDGE (M19AC0003)

UNIT-I: Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

UNIT-II: Order, Introduction of roots, Technical information about Sanskrit Literature

UNIT-III: Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1110	
Course Title: ADVANCED COMPUTER NETWORKS	
CO-1	Understanding basic Sanskrit language.
CO-2	Ancient Sanskrit literature about science & technology can be understood.
CO-3	Being a logical language will help to develop logic in students.

SYLLABUS: VALUE EDUCATION (M19AC0004)

UNIT-I: Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgments.

UNIT-II: Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, NationalUnity, Patriotism, Love for nature , Discipline.

UNIT-III: Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free fromanger, Dignity of labor. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits.Association and Cooperation, Doing best for saving nature

UNIT-IV: Character and Competence –Holy books vs Blind faith. Self-management and Good health.Science of reincarnation. Equality, Nonviolence ,Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studyingeffectively.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1110	
Course Title: ADVANCED COMPUTER NETWORKS	
CO-1	Knowledge of self-development
CO-2	Learn the importance of Human values
CO-3	Developing the overall personality

SYLLABUS: CONSTITUTION OF INDIA (M19AC0005)

UNIT-I: History of Making of the Indian Constitution: History , Drafting Committee, (Composition & Working)

UNIT-II: Philosophy of the Indian Constitution: Preamble ,Salient Features

UNIT-III: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights ,Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT-IV: Organs of Governance: Parliament, Composition, Qualifications and Disqualifications ,Powers and Functions, Executive, President , Governor, Council of Ministers, Judiciary, Appointment and Transferof Judges, Qualifications, Powers and Functions Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zilla Panchayat. Elected officials and their roles, CEO Zilla Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments),Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT-V: Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0005	
Course Title: CONSTITUTION OF INDIA	
CO-1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO-2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
CO-3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure ofthe proposal of direct elections through adult suffrage in the Indian Constitution.
CO-4	Discuss the passage of the Hindu Code Bill of 1956.

SYLLABUS: PEDAGOGY STUDIES (M19AC0006)

UNIT-I: Introduction and Methodology:
Aims and rationale, Policy background, Conceptual framework and terminology Theoriesof learning, Curriculum, Teacher education. Conceptual framework, Research questions.
Overview of methodology and Searching.

UNIT-II: Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries, Curriculum, Teacher education.

UNIT-III: Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effectivepedagogy.

UNIT-IV: Theory of change, Strength and nature of the body of evidence for effective pedagogical practices Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies. Professional development: alignment with classroom practices and follow-up support

UNIT-V: Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0006	
Course Title: PEDAGOGY STUDIES	
CO-1	Illustrate reference models with layers, protocols and interfaces.
CO-2	Describe Sub netting and Addressing of IP V4andIPV6.
CO-3	Describe and Analysis of basic protocols of computer networks, and how they can be used to assist in network design and implementation.
CO-4	Discuss the concepts of congestion control and quality of service
CO-5	Demonstrate Data Communications System and its components.

SYLLABUS: STRESS MANAGEMENT BY YOGA (M19AC0007)

UNIT-I: Definitions of Eight parts of yoga (Ashtanga)

UNIT-II: Yam and Niyam.

Do's and Don'ts in life.

i) Ahinsa, satya, astheya, brahmacharya and aparigraha

ii) Shaucha, santosh, tapa, swadhyay, ishvarapranidhana

UNIT-III: Asan and Pranayam

i) Various yoga poses and their benefits for mind & body

ii) Regularization of breathing techniques and its effects-Types pranayama

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0007	
Course Title: STRESS MANAGEMENT BY YOGA	
CO-1	Develop a healthy mind in a healthy body thus improving social health also.
CO-2	Improve efficiency

SYLLABUS: PERSONALITY DEVELOPMENT THROUGH LIFEENLIGHTENMENT SKILLS (M19AC0008)

UNIT-I: Neetisatakam-Holistic development of personality

Verses- 19,20,21,22 (wisdom), Verses- 29,31,32 (pride & heroism)

Verses- 26,28,63,65 (virtue),Verses- 52,53,59 (don'ts),Verses- 71,73,75,78 (do's).

UNIT-II: Approach to day to day work and duties. ShrimadBhagwadGeeta : Chapter 2-Verses: 41,47,48

Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,

Chapter 18-Verses 45, 46, 48.

UNIT-III: Statements of basic knowledge, Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68, Chapter 12 -Verses 13, 14, 15, 16,17, 18, Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39, Chapter18 – Verses 37,38,63

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0008	
Course Title: PERSONALITY DEVELOPMENT THROUGH LIFEENLIGHTENMENT SKILLS	
CO-1	Study of Shrimad – Bhagwad - Geeta will help the student in developing his personality and achieve the highest goal in life.
CO-2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity.
CO-3	Study of Neetishatakam will help in developing versatile personality of students.

Regulation: R19								I / II - M.Tech. II - Semester		
COMPUTER SCIENCE & TECHNOLOGY (Under Choice Based Credit System / Elective Course System)										
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2019-20 admitted Batch onwards)										
Course Code	**Course Name**	**Category**	**Cr.**	**L**	**T**	**P**	**Int. Marks**	**Ext. Marks**	**Total Marks**	
M19 CST 1201	Advanced Algorithms	PC	3	3	0	0	25	75	100	
M19 CST 1202	Machine Learning	PC	3	3	0	0	25	75	100	
#PE-III	Program Elective-III	PE	3	3	0	0	25	75	100	
#PE-IV	Program Elective-IV	PE	3	3	0	0	25	75	100	
M19 CST 1213	Advance Algorithm Lab	PC	2	0	0	4	25	75	100	
M19 CST 1214	Machine Learning Lab	PC	2	0	0	4	25	75	100	
M19 CST 1215	Mini Project with Seminar	MP	2	0	0	4	100	--	100	
#AC-2	Audit Course-2*	AC	0	2	0	0	0	0	--	
		Total	**18**	**14**	**0**	**12**	**250**	**450**	**700**	

	Code	Course
#PE-III	M19CST1203	Soft Computing
	M19CST1204	Advanced Network Principles and Protocols
	M19CST1205	Internet of Things
	M19CST1206	Open Source Programming
	M19CST1207	Pattern Recognition
#PE-IV	M19CST1208	Natural Language Processing
	M19CST1209	Full Stack Technologies
	M19CST1210	Parallel Algorithms
	M19CST1211	Object Oriented Software Engineering
	M19CST1212	Distributed Database

COMPUTER SCIENCE & TECHNOLOGY
SYLLABUS : ADVANCED ALGORITHMS (M19CST1201)

UNIT-I : Sorting: Review of various sorting algorithms, topological sorting

Graph: Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge- weighted case (Dijkasra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, exampleof amortized analysis.

UNIT-II : Matroids: Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST.

Graph Matching : Algorithm to compute maximum matching. Characterization ofmaximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.

UNIT-III: Flow-Networks: Max flow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm.

Matrix Computations: Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.

UNIT-IV: Shortest Path in Graphs: Floyd-Warshall algorithm and introduction to dynamicprogramming paradigm. More examples of dynamic programming. **Modulo Representation of integers/polynomials:** Chinese Remainder Theorem, Conversion between base- representation and modulo-representation. Extension to polynomials. Application:Interpolation problem.

Discrete Fourier Transform (DFT): In complex field, DFT in modulo ring. Fast FourierTransform algorithm. Schonhage - Strassen Integer Multiplication algorithm

UNIT-V: Linear Programming: Geometry of the feasibility region and Simplex algorithm. **NP-completeness:** Examples, proof of NP-hardness and NP-completeness. One or more of the following topics based on time and interest Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number Theoretic Algorithm Recent Trends in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST2101	
Course Title ADVANCED ALGORITHMS	
CO-1	Analyze the complexity/performance of different algorithms.
CO-2	Determine the appropriate data structure for solving a particular set of problems.
CO-3	Categorize the different problems in various classes according to their complexity.
CO-4	Students should have an insight of recent activities in the field of the advanceddata structure.

SYLLABUS : MACHINE LEARNING (M19CST1202)

UNIT-I : Introduction : Towards Intelligent Machines, Well posed Problems, Example of Applications in diverse fields, Data Representation, Domain Knowledge for Productive use of Machine Learning, Diversity of Data: Structured / Unstructured, Forms of Learning, Machine Learning and Data Mining, Basic Linear Algebra in Machine Learning Techniques.

UNIT-II : Supervised Learning : Rationale and Basics: Learning from Observations, Bias and Why Learning Works: Computational Learning Theory, Occam's Razor Principle and Over fitting Avoidance Heuristic Search in inductive Learning, Estimating Generalization Errors, Metrics for assessing regression, Metris for assessing classification.

UNIT-III: Statistical Learning : Machine Learning and Inferential Statistical Analysis, Descriptive Statistics in learning techniques, Bayesian Reasoning: A probabilistic approach to inference, K-Nearest Neighbor Classifier. Discriminant functions and regression functions, Linear Regression with Least Square Error Criterion, Logistic Regression for Classification Tasks, Fisher's Linear Discriminant and Thresholding for Classification, Minimum Description Length Principle.

UNIT-IV: Support Vector Machines (SVM) : Introduction, Linear Discriminant Functions for Binary Classification, Perceptron Algorithm, Large Margin Classifier for linearly seperable data, Linear Soft Margin Classifier for Overlapping Classes, Kernel Induced Feature Spaces, Nonlinear Classifier, Regression by Support vector Machines.
Learning with Neural Networks : Towards Cognitive Machine, Neuron Models, Network Architectures, Perceptrons, Linear neuron and the Widrow-Hoff Learning Rule, The error correction delta rule.

UNIT-V: Multilayer Perceptron Networks and error back propagation algorithm, Radial Basis Functions Networks. **Decision Tree Learning**: Introduction, Example of classification decision tree, measures of impurity for evaluating splits in decision trees, ID3, C4.5, and CART decision trees, pruning the tree, strengths and weakness of decision tree approach.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1101	
Course Title: MACHINE LEARNING	
CO-1	Recognize the characteristics of machine learning algorithms and their applicationsto real world problems
CO-2	Able to write and evaluate hypothesis
CO-3	Apply kernel methods to solve real world problems.

SYLLABUS : SOFT COMPUTING (M19CST1203)

UNIT-I : Fuzzy Set Theory: Introduction to Neuro – Fuzzy and Soft Computing, Fuzzy Sets, Basic Definition and Terminology, Set-theoretic Member Function Formulation and Parameterization, Fuzzy Rules and Fuzzy Reasoning, Extension Principle and Fuzzy Relations Fuzzy If-Then Rules, Fuzzy Reasoning, Fuzzy Inference Systems, Mamdani Fuzzy Models, Surgeon Fuzzy Models, Tsukamoto Fuzzy Models, Input Space Partitioning and Fuzzy Modeling.

UNIT-II : Optimization: Derivative based Optimization, Descent Methods, The Method of Steepest Descent, Classical Newton's Method, Step Size Determination, Derivative-free Optimization, Genetic Algorithms, Simulated Annealing and Random Search – Downhill Simplex Search.

UNIT-III: Artificial Intelligence: Introduction, Knowledge Representation, Reasoning, Issues and Acquisition: Prepositional and Predicate Calculus Rule Based knowledge Representation Symbolic Reasoning under Uncertainty Basic knowledge Representation Issues Knowledge acquisition, Heuristic Search: Techniques for Heuristic search Heuristic Classification State Space Search: Strategies Implementation of Graph Search based on Recursion Patent directed Search Production System and Learning.

UNIT-IV: Neuro Fuzzy Modeling: Ad ptive Neuro-Fuzzy Inference Systems, Architecture – Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

UNIT-V: Applications Of Computational Intelligence: Printed Character Recognition, Inverse Kinematics Problems, Automobile Fuel Efficiency Prediction, Soft Computing for Color Recipe Prediction.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST2103	
Course Title: SOFT COMPUTING	
CO-1	Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory
CO-2	Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic
CO-3	To understand the fundamental theory and concepts of neuralnetworks, Identify different neural network architectures, algorithms, applications and their limitations
CO-4	Understand appropriate learning paradigms and its applications rules for eachof the architectures and learn several neural network
CO-5	Reveal different applications of these models to solve engineering and otherproblems.

SYLLABUS : ADVANCED NETWORK PRINCIPLES AND PROTOCALS (M19CST1204)

UNIT-I : Introduction to Networks - Application of Networks - Architecture Topology Switching -SLIP, PPP - ALOHA protocols, CSMA/CD, IEEE 802.3, 802.4, 802.5

UNIT-II : Network Layer Issues- Routing, Congestion control- Internetworking - Issues, AddressLearning Bridges, Spanning tree, Source routing, Bridges, Routers, Gateway.

UNIT-III: Network Protocol- IP datagram - hop by hop routing, ARP, RARP, DHCP -Sub net Addressing, Address Masking, ICMP, RIP, RIPV2, OSPF, DNS, LAN and WAN Multicast.

UNIT-IV: Transport Layer- Design issues, Connection Management, Transmission Control Protocol (TCP) - User Datagram Protocol (UDP).

UNIT-V: Application Layer Protocol- Telnet - TFTP - FTP - SMTP - Ping Finger, BootstrapNetwork Time Protocol-SNMP.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST2104	
Course Title: ADVANCED NETWORK PRINCIPLES AND PROTOCALS	
CO-1	Familiarization of the different layers of TCP/IP protocol stack
CO-2	Understanding of the working principle of different protocols at different layers

SYLLABUS : INTERNET OF THINGS (M19CST1205)

UNIT-I : FUNDAMENTALS OF IoT: Evolution of Internet of Things, Enabling Technologies, IoTArchitectures,oneM2M, IoT World Forum (IoTWF) and Alternative IoT models, Simplified IoT Architecture andCore IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects

UNIT-II : IoT PROTOCOLS: IT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks, Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks,Application Transport Methods: Supervisory Control and Data Acquisition, Application Layer Protocols: CoAP and MQTT. Bluetooth Smart Connectivity-Overview, Key Versions, BLE-Bluetooth Low Energy Protocol, Low Energy Architecture.

UNIT-III: Data Acquiring and storage, organizing the Data and Analytics, Cloud Computingparadigm for Data Collection, Storage and computing. DESIGN AND DEVELOPMENT: Embedded computing logic, Microcontroller, System on Chips, IoT system buildingblocks, Arduino, Board details, IDE programming, Raspberry Pi.

UNIT-IV: Arm Based Embedded System Design: ARM Cortex-A class processor, Embedded Devices-ARM Cortex-MClass processor, Networking-Bluetooth Smart Technology Introduction to embedded systems: CPUs vs MCU's vs Embedded Systems, Examples, Options for Building Embedded Systems, Features of Embedded Systems, Building Embedded Systems, Building Embedded Systems using MCUs, Introduction to mbed TM Platform

UNIT-V: CASE STUDIES/INDUSTRIAL APPLICATIONS: Cisco IoT system, IBM Watson IoT platform, Manufacturing, Converged Plant wide Ethernet Model (CPwE), Power Utility Industry, Grid Blocks Reference Model, Smart and Connected Cities: Layered architecture,Smart Lighting, Smart Parking Architecture and Smart Traffic Control.

Course Outcomes for First Year First Semester Course	
Course Code: **M19CST2105**	
Course Title: **INTERNET OF THINGS**	
CO-1	Summarize on the term 'internet of things' in different contexts.
CO-2	Analyze various protocols for IoT.
CO-3	Design a PoC of an IoT system using Rasperry Pi/Arduino
CO-4	Apply data analytics and use cloud offerings related to IoT.
CO-5	Analyze applications of IoT in real time scenario

SYLLABUS : OPEN SOURCE PROGRAMMING (M19CST1206)

UNIT-I : INTRODUCTION: Introduction to open source programming languages, advantages and drawbacks ofopen source programming, threats and vulnerabilities in open source languages, Operating System – Ubuntu Linux – Introduction to shell programming.

UNIT-II : PHP: PHP Language Basics, Functions - calling a function, variable function, and anonymous function, Strings - cleaning, encoding and escaping, and comparing strings, Arrays – storing data in arrays, extracting multiple values, traversing, and sorting arrays, Objects – creation, introspection, and serialization, Web Techniques – processing formsand maintaining state.

UNIT-III: WEB DATABASE APPLICATIONS: Three-tier architecture, Introduction to Object oriented programming with PHP 5, Database basics, MYSQL - querying web databases, writing to web databases, validation with Javascript, Form based authentication, protecting data on the web.

UNIT-IV: PERL, TCL, AND PYTHON : Numbers and Strings, Control Statements, Lists and Arrays, Files, Pattern matching,Hashes, Functions. Introduction to TCL/TK, Introduction to Python.

UNIT-V: SECURITY IN WEB APPLICATIONS : Recognizing web application security threats, Code Grinder, Building functional and secure web applications, Security problems with Javascript, vulnerable GCI scripts, Code Auditing and Reverse Engineering, types of security used in applications.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST2106	
Course Title: OPEN SOURCE PROGRAMMING	
CO-1	Develop codes in open source web applications
CO-2	Understand the risks associated with the open source codes
CO-3	Write secure CGI scripts

SYLLABUS : PATTERN RECOGNITION (M19CST1207)

UNIT-I : Introduction - Basic concepts, Applications, Fundamental problems in pattern Recognition system design, Design concepts and methodologies, Examples of Automatic Pattern recognition systems, Simple pattern recognition model, Decision and Distance Functions - Linear and generalized decision functions, Pattern space and weight space, Geometrical properties, implementations of decision functions, Minimum-distance pattern classifications.

UNIT-II : Probability-Probability of events, Random variables, Joint distributions and densities, Movements of random variables, Estimation of parameter from samples, Statistical Decision Making - Introduction, Baye's theorem, Multiple features, Conditionally independent features, Decision boundaries, Unequal cost of error, estimation of error rates, the leaving-one-out-techniques, characteristic curves, estimating the composition of populations. Baye's classifier for normal patterns.

UNIT-III: Non Parametric Decision Making - Introduction, histogram, kernel and window estimation, nearest neighbor classification techniques. Adaptive decision boundaries, adaptive discriminate functions, Minimum squared error Discriminate functions, choosing a decision making techniques. Clustering and Partitioning - Hierarchical Clustering: Introduction, agglomerative clustering algorithm, the single-linkage, complete-linkage and average-linkage algorithm. Ward's method Partition clustering-Forg's algorithm, K- means's algorithm, Isodata algorithm.

UNIT-IV: Pattern Preprocessing and Feature Selection: Introduction, distance measures, clustering transformation and feature ordering, clustering in feature selection through entropy minimization, features selection through orthogonal expansion, binary feature selection.

UNIT-V: Syntactic Pattern Recognition & Application Of Pattern Recognition: Introduction, concepts from formal language theory, formulation of syntactic pattern recognition problem, syntactic pattern description, recognition grammars, automata as pattern recognizers, Application of pattern recognition techniques in bio-metric, facial recognition, IRIS scan, Finger prints, etc.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST2107	
Course Title: PATTERN RECOGNITION	
CO-1	Design systems and algorithms for pattern recognition (signal classification), with focus on sequences of patterns that are analyzed using, e.g., hidden Markovmodels (HMM)
CO-2	Analyze classification problems probabilistically and estimate classifier performance
CO-3	Understand and analyze methods for automatic training of classification systems,
CO-4	Apply Maximum-likelihood parameter estimation in relatively complex probabilistic models, such as mixture density models and hidden Markov models
CO-5	Understand the principles of Bayesian parameter estimation and apply them in relatively simple probabilistic models

SYLLABUS : NATURAL LANGUAGE PROCESSING (M19CST1208)

UNIT-I : Introduction: NLP tasks in syntax, semantics, and pragmatics. Applications such as information extraction, question answering, and machine translation. The problem of ambiguity. The role of machine learning. Brief history of the field.

UNIT-II : N-gram Language Models: The role of language models, Simple Ngram models. Estimating parameters and smoothing. Evaluating language models. **Part of Speech Tagging and Sequence Labeling:** Lexical syntax. Hidden Markov Models. Maximum Entropy Models. Conditional Random Fields

UNIT-III: Syntactic parsing: Grammar formalisms and tree banks. Efficient parsing for context-free grammars(CFGs). Statistical parsing and probabilistic CFGs (PCFGs). Lexicalized PCFGs.

UNIT-IV: Semantic Analysis: Lexical semantics and word-sense disambiguation. Compositional semantics. SemanticRole Labeling and Semantic Parsing.

UNIT-V: Information Extraction (IE) and Machine Translation (MT):
Named entity recognition and relation extraction. IE using sequence labeling. Basic issues in MT. Statistical translation, word alignment, phrase based translation, and synchronous grammars. Dialogues: Turns and utterances, grounding, dialogue acts and structures Natural Language Generation: Introduction to language generation, architecture, discourse planning (text schemata, rhetorical relations).

Course Outcomes for First Year First Semester Course	
Course Code: M19CST2108	
Course Title: NATURAL LANGUAGE PROCESSING	
CO-1	Explain approaches to syntax and semantics in NLP.
CO-2	Demonstrate approaches to discourse, generation, dialogue and summarization within NLP.
CO-3	Explain current methods for statistical approaches to machine translation.
CO-4	Identify machine learning techniques used in NLP, including hidden Markov models and probabilistic
CO-5	Explain context-free grammars, clustering and unsupervised methods, log- linear and discriminative

SYLLABUS : FULL STACK TECHNOLOGIES (M19CST1209)

UNIT-I : HTML: Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols -The World Wide Web-HTTP request message-responsemessage-WebClients Web Servers. Markup Languages: XHTML, an Introduction to HTML, History, Versions, Basic, XHTML Syntax and Semantics Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms-HTML 5.0.

UNIT-II : Cascading Style Sheets (CSS)

Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML-Style Rule Cascading and Inheritance-Text Properties-Box Model Normal Flow Box Layout beyond the Normal Flow- CSS3.0, Boot strap basics, Boot strap CSS3, Introduction to Java Script, Jscript basics, JScripts objects, JSON, Don.

UNIT-III: PHP

Introduction to PHP, Language Basics, Functions, Strings, Arrays. MYSQL Installation, Accessing MySQL Using PHP, Form Handling, Cookies, Sessions, and Authentication, Tables, Inserting Data into Tables, Selecting Data from a Table, Updating Table, Deleting data from Table, Webpage creation.

UNIT-IV: Angular Js

Introducing Angular JS, Starting Out with Angular JS, Basic Angular JS, Directives and Controllers, Angular JS Modules, Creating First Controller, working with and Displaying, Arrays, more Directives, working with ng-repeat, Unit Testing in Angular JS, Forms, Inputs, and Services, Working with ng-model, Working with Forms,Leverage Data-Binding and Models, Form Validation and States, Error Handling with Forms, ng Model Options, Nested Forms with ng-form, Other Form Controls.

UNIT-V: React JS

Introduction to React, Obstacles and Roadblocks, keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, React DOM, Children, Constructing Elements with Data, React Components, DOM Rendering, Factories

Course Outcomes for First Year First Semester Course	
Course Code: M19CST2109	
Course Title: FULL STACK TECHNOLOGIES	
CO-1	Identify the Basic Concepts of Web & Markup Languages
CO-2	Develop web Applications using Scripting Languages & Frameworks
CO-3	Creating and running applications using PHP
CO-4	Creating Our First Controller Working with and Displaying in Angular Js and Nested Forms with ng-form
CO-5	Working with the Files in React JS and Constructing Elements with Data

SYLLABUS : PARALLEL ALGORITHMS (M19CST1210)

UNIT-I :Introduction :

Computational demand in various application areas, advent of parallel processing, terminology-pipelining, Data parallelism and control parallelism-Amdahl's law.

UNIT-II : Scheduling:

Organizational features of Processor Arrays, Multi processors and multi-computers. Mapping and scheduling aspects of algorithms. Mapping into meshes and hyper cubes-Load balancing-List scheduling algorithm Coffman-graham scheduling algorithm for parallel processors.

UNIT-III: Algorithms :

Elementary Parallel algorithms on SIMD and MIMD machines, Analysis of these algorithms. Matrix Multiplication algorithms on SIMD and MIMD models. FastFourier Transform algorithms. Implementation on Hyper cube architectures. Solving linear file -system of equations, parallelizing aspects of sequential methods back substitution and Tri diagonal.

UNIT-IV: Sorting:

Parallel sorting methods, Odd-even transposition Sorting on processor arrays, Biotonic ,merge sort on shuffle - exchange ID , Array processor,2D-Mesh processor and Hypercube Processor Array. Parallel Quick-sort on Multi processors. Hyper Quick sort on hypercube multi computers. Parallel search operations. Ellis algorithm and Manber and ladner's Algorithms for dictionary operations.

UNIT-V: Searching

Parallel algorithms for Graph searching, All Pairs shortest paths and inimum cost spanning tree. Parallelization aspects of combinatorial search algorithms with Focus on Branch and Bound Methods and Alpha-beta Search methods.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST2110	
Course Title: PARALLEL ALGORITHMS	
CO-1	Understand fundamental concepts of parallelism- pipeline, Amdahl's law.
CO-2	Know the physical limits of linear approach and solving problems in parallel.
CO-3	How to design & analyze parallel algorithms and implement them with parallel processors.
CO-4	Understand various approaches in parallel sorting and Searching.
CO-5	Gain knowledge on various parallel processor architectures and know how to embed one Architecture into another.

SYLLABUS : OBJECT ORIENTED SOFTWARE ENGINEERING (M19CST1211)

UNIT-I : Introduction to Software Engineering- What is Software Engineering, Software Engineering Concepts, Software Engineering Development Activities, Managing Software Development, Case Study, **Modeling with UML-** Introduction – Overview of UML – Modeling Concepts – Deeper View into UML.

UNIT-II : Project Organization and Communications- Introduction, An Overview of Projects, Project Organization Concepts, Project Communication Concepts, Organizational Activities, **Analysis-** Introduction, Overview of Analysis, Analysis Concepts, Analysis Activities, Managing Analysis, Case study.

UNIT-III: System Design- Overview of System Design, System Design Concepts, System Design activities, Managing System Design, Case study, **Object Design-** Overview of Object design, Reuse Concepts, Reuse Activities, Managing Reuse, Case study.

UNIT-IV: Mapping Models to Code- Overview of mapping, Mapping concepts, Mapping Activities, Mapping Implementation, Case study, **Configuration Management and Project Management-** Configuration Management Overview, Concepts, Activities and Managing Configuration Management, Overview of Project management, Project Management Concepts, Project Management Activities.

UNIT-V: Software Life Cycle- Introduction, IEEE 1074, Characterizing the Maturity to Software Life Cycle Models, Life cycle Models, **Methodologies-** Introduction, Project Environment, Methodology Issues, A Spectrum of Methodologies, Case studies.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST2111	
Course Title: OBJECT ORIENTED SOFTWARE ENGINEERING	
CO-1	Apply object-oriented programming principles to real-time problems..
CO-2	Analyze of a formally specified problem statement with respect to its accuracy and completeness, to effective testing of the software product.
CO-3	Examine the specialized knowledge, skill and judgment needed to develop complex software by formulating relevant responses at each stage of the software development life-cycle.
CO-4	Produce appropriate documentation accurately and to a professional standard.
CO-5	Apply skills relevant for academic progression and career development within the sector.

SYLLABUS : DISTRIBUTED DATABASES (M19CST1212)

UNIT-I : Introductory concepts and design of (DDBMS)

Data Fragmentation; Replication; and allocation techniques for DDBMS; Methods for designing and implementing DDBMS, designing a distributed relational database; Architectures for DDBMS: cluster federated, parallel databases and client serverarchitecture.

UNIT-II : Query processing & Transaction Management

Overview Of Query Processing: Query processing problem; Objectives of Query Processing; Complexity of Relational Algebra operations; characterization of Query processors; Layers of Query Processing Introduction To Transaction Management: Definition of Transaction, Properties of Transaction, types of transaction ; Distributed Concurrency Control: Serializability theory; Taxonomy of concurrency control mechanisms; locking bases concurrency control algorithms.

UNIT-III: Distributed Object Database Management systems

Fundamental Object concepts and Object models; Object distribution design; Architectural issues; Object management; Distributed object storage; Object queryprocessing.

UNIT-IV: Current trends & developments related to Distributed database applications technologies Distributed Object/component-based DBMS; Database Interoperabilityincluding CORBA; DCOM and Java RMI; Distributed document-based systems; XML and Workflow management

UNIT-V: Emerging related database technologies

Parallel Database; Mobile database; Multimedia Database; Spatial Database and WebDatabases.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST2112	
Course Title: DISTRIBUTED DATABASES	
CO-1	Identify the introductory distributed database concepts and its structures.
CO-2	Describe terms related to distributed object database design and management.
CO-3	Produce the transaction management and query processing techniques inDDBMS.
CO-4	Relate the importance and application of emerging database technology.

SYLLABUS : ADVANCE ALGORITHMS LAB (M19CST1213)

LIST OF EXPERIMENTS

1. Write a program to implement topological sorting.
2. Write a program to find inverse of a matrix.
3. Write a program to implement Floyd-Warshalls' algorithm using dynamic programming
4. Write a program to find longest common subsequence of two strings
5. Write a program to implement BFS for a Graph
6. Write a program to use DFS to find strongly connected components of a digraph.
7. Write a program to implement matrix chain multiplication.
8. Write a program to implement randomized Quick Sort.
9. Write a program to solve Travelling Salesperson Problem using twice around the tree algorithm (approximation algorithm).
10. Write a program to implement FFT.
11. Write a program to implement Krushkal's algorithm to generate a min-cost spanning tree.
12. Write a program to implement Prim's algorithm to generate a min-cost spanning tree.
13. Write a program to implement Extended Euclid algorithm to find gcd of two numbers.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST2113	
Course Title: ADVANCE ALGORITHMS LAB	
CO-1	Identify classes, objects, members of a class and relationships among them needed for a specific problem.
CO-2	Examine algorithms performance using Prior analysis and asymptotic notations.
CO-3	Organize and apply to solve the complex problems using advanced data structures (like arrays, stacks, queues, linked lists, graphs and trees.)
CO-4	Apply and analyze functions of Dictionary

SYLLABUS : MACHINE LEARNING LAB (M19CST1214)
LIST OF EXPERIMENTS

Experiments: ***Note: Implement using R and Python***

1. Write a program to apply the following machine learning methods on any chosen dataset: a) Linear Regression b) Logistic Regression.
2. Write a program to implement Support Vector Machines.
3. Perform Exploratory Data Analysis for Classification using Pandas and Matplotlib.
4. Write a program to implement to analyze Bias, Variance, and Cross Validation.
5. Write a program to simulate a perception network for pattern classification and function approximation.
6. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
7. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
8. Write a program to implement the naïve Bayesian classifier for Iris data set. Compute the accuracy of the classifier, considering few test data sets.
9. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
10. Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
11. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.
12. Implementing data visualization using R
    Find the data distributions using box and scatter
    plot.Find the outliers using plot.
    Plot the histogram, bar chart and pie chart on sample data.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST2114	
Course Title: MACHINE LEARNING LAB	
CO-1	Implement procedures for the machine learning algorithms
CO-2	Apply appropriate data sets to the Machine Learning algorithms
CO-3	Identify and apply Machine Learning algorithms to solve real world problems
CO-4	Design Python programs for various Learning algorithms

SYLLABUS : MINI PROJECT WITH SEMINAR (M19CST1215)

For Mini Project with Seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Project Review Committee consisting of Head of the Department, supervisor/mentor and two other senior faculty members of the department. For Mini Project with Seminar, there will be only internal evaluation of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

SYLLABUS : AUDIT COURSE-2 (#AC-2)

List of Audit Courses and their Syllabi are mentioned in the First Semester Syllabus.

The students can opt any one course for AC 2 from the list mentioned in first semester by not opting the course which is already taken for AC 1

Regulation: R19							II / II - M.Tech. I - Semester		
COMPUTER SCIENCE & TECHNOLOGY (Under Choice Based Credit System / Elective Course System)									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2019-20 admitted Batch onwards)									
Course Code	**Course Name**	**Category**	**Cr.**	**L**	**T**	**P**	**Int. Marks**	**Ext. Marks**	**Total Marks**
#PE-V/ MOOCS	Program Elective-V	PE	3	3	0	0	25	75	100
#OE-I/ MOOCS	Open Elective-I	OE	3	3	0	0	25	75	100
M19CST 2105	**Dissertation-I / Industrial Project**	PR	10	0	0	20	50	50	100
TOTAL			**16**	**6**	**0**	**20**	**100**	**200**	**300**

	Code	Course
#PE-V	M19CST2101	Deep Learning
	M19CST2102	Ethical Hacking
	M19CST2103 (MOOCS-I)	Students Going for Industrial Project / Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a 12 weeks' course duration in PG level with 3 credits, but the chosen subject should not be covered in their M. Tech Course
#OE-I	OE	Students have to choose one open elective course offered by departments other than the CSE & IT departments. List of open Electives offered by other departments are enclosed.
	M19CST2104(MOOCS-II)	Students Going for Industrial Project / Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a 12 weeks' course duration in PG level with 3 credits, but the chosen subjectshould not be covered in their M. Tech Course

OPEN ELECTIVES OFFERED TO OTHER DEPARTMENTS	
Code	**Course**
M19 CST 2106	Python Programming
M19 CST 2107	Artificial Intelligence
M19 CST 2108	Advanced Data structures

COMPUTER SCIENCE & TECHNOLOGY

SYLLABUS : DEEP LEARNING (M19CST2101)

UNIT-I : Introduction: Various paradigms of learning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques. **Feed forward neural network:** Artificial Neural Network, activation function, multi-layer neural network

UNIT-II : Training Neural Network: Risk minimization, loss function, back propagation, regularization, model selection, and optimization. **Deep Neural Networks:** Difficulty of training deep neural networks, Greedy layer wise training.

UNIT-III: Deep Learning: Deep Feed Forward network, regularizations, training deep models, dropouts, Convolution Neural Network, Recurrent Neural Network, and Deep Belief Network.

UNIT-IV: Probabilistic Neural Network: Hopfield Net, Boltzmann machine, RBMs, Sigmoid net, Auto encoders.

UNIT-V: Applications: Object recognition, sparse coding, computer vision, natural language processing. **Introduction to Deep Learning Tools:** Tensor Flow, Caffe, Theano, Torch

Course Outcomes for First Year First Semester Course	
Course Code: M19CST2101	
Course Title: DEEP LEARNING	
CO-1	Demonstrate the basic concepts fundamental learning techniques and layers.
CO-2	Discuss the Neural Network training, various random models.
CO-3	Explain different types of deep learning network models.
CO-4	Classify the Probabilistic Neural Networks.
CO-5	Implement tools on Deep Learning techniques.

SYLLABUS : ETHICAL HACKING (M19CST2102)

UNIT-I : Hacking Windows: BIOS Passwords, Windows Login Passwords, Changing Windows Visuals, Cleaning Your Tracks, Internet Explorer Users, Cookies, URL Address Bar, Netscape Communicator, Cookies URL History, The Registry, Baby Sitter Programs.

UNIT-II : Advanced Windows Hacking: Editing your Operating Systems by editing Explorer.exe, TheRegistry, The Registry Editor, Description of .reg file, Command Line Registry Arguments, Other System Files, Some Windows & DOS Tricks, Customize DOS, Clearing the CMOS without opening your PC, The Untold Windows Tips and Tricks Manual,Exiting Windows the Cool and Quick Way, Ban Shutdowns: A Trick to Play, Disabling Display of Drives in My Computer, Take Over the Screen Saver, Pop a Banner each time Windows Boots, Change the Default Locations, Secure your Desktop Icons and Settings.

UNIT-III: Getting Past the Password: Passwords: An Introduction, Password Cracking, Cracking theWindows Login Password, The Glide Code, Windows Screen Saver Password, XOR, Internet Connection Password, Sam Attacks, Cracking Unix Password Files, HTTP Basic Authentication, BIOS Passwords, Cracking Other Passwords.

UNIT-IV: The Perl Manual: Perl: The Basics, Scalars, Interacting with User by getting Input, Chomp() and Chop(), Operators, Binary Arithmetic Operators, The Exponentiation Operator(**), The Unary Arithmetic Operators, Other General Operators, Conditional Statements, Assignment Operators. The : Operator, Loops, The While Loop, The For Loop, Arrays, THE FOR EACH LOOP: Moving through an Array, Functions Associated with Arrays, Push() and Pop(), Unshift() and Shift(), Splice(), Default Variables, $_, @ARGV, Input Output, Opening Files for Reading, Another Special Variables.

UNIT-V: Virus Working, Boot Sector Viruses (MBR or Master Boot Record), File or Program Viruses, Multipartite Viruses, Stealth Viruses, Polymorphic Viruses, Macro Viruses, Blocking Direct Disk Access, Recognizing Master Boot Record (MBR) Modifications, Identifying Unknown Device Drivers, making own Virus, Macro Viruses, Using Assembly to Create your own Virus, Modifying a Virus so Scan won't Catch it, Creating New Virus Strains, Simple Encryption Methods.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST2102	
Course Title: ETHICAL HACKING	
CO-1	Remember various hacking methods, system security vulnerability testing.
CO-2	Apply system vulnerability attacks and demonstrate a security assessment report
CO-3	Understand various issues related to hacking

SYLLABUS : MOOCS-I (M19CST2103)

Students Going for Industrial Project / Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a 12 weeks' course duration in PG level with 3 credits, but the chosen subject should not be covered in their M. Tech Course

SYLLABUS : OPEN ELECTIVE

Students have to choose one open elective course offered by departments other than the CSE & IT departments.
List of open Electives offered by other departments are given below.

Offered from	Course Code	Course Name	Offered to
CIVIL ENGINEERING	M19 ST 2107	Construction Management	**CST, CS, PSA,IT & CAD/CAM**
	M19 ST 2108	Green Technology	
	M19 ST 2109	Analysis of Offshore Structures	
ELECTRONICS & COMMUNICATIONENGINEERING	M19 CS 2107	Signals and systems	**ST, CST, PSA, IT & CAD/CAM**
	M19 CS 2108	Principles of Communication	
	M19 CS 2109	Image and video Processing	
ELECTRICAL & ELECTRONICS ENGINEERING	M19PS2107	Electric And Hybrid Vehicles	**ST, CST, CS, IT & CAD/CAM**
	M19PS2108	Energy From Waste	
	M19PS2109	Energy Management and Auditing	
MECHNAICAL ENGINEERING	M19CAD 2107	Operations Research	**ST, CST, CS,PSA & IT**
	M19CAD 2108	Nano Technology	
	M19CAD 2109	Product Design & Manufacturing	
SCIENCE & HUMANITIES	M19BS2101	Management and OrganisationalBehaviour	**ST, CST, CS,PSA, IT & CAD/CAM**

SYLLABUS : MOOCS-II (M19CST2104)

Students Going for Industrial Project / Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a 12 weeks' course duration in PG level with 3 credits, but thechosen subject should not be covered in their M. Tech Course

SYLLABUS : DISSERTATION-I/INDUSTRIAL PROJECT (M19CST2105)

The Student has to register for Dissertation-I / Industrial project in III semester. Student has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work for approval. The student can initiate the Project work, only after obtaining the approval from the Project Review Committee (PRC).

Continuous assessment of Dissertation-I during the III-Semester will be monitored by the PRC. Dissertation-I/ Industrial Project is evaluated for 50 internal marks and 50 external marks.

Internal marks 50 awarded by Project Guide and PRC jointly based on continuous assessment consistingof two seminars based on Dissertation work-I.

External marks 50 awarded by External Examiner, Supervisor and Head of the Department jointly based on a review and Viva voce on Dissertation work-I.

Regulation: R19									**II / II - M.Tech. II - Semester**
COMPUTER SCIENCE & TECHNOLOGY **(Under Choice Based Credit System / Elective Course System)**									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2019-20 admitted Batch onwards)									
Course Code	**Course Name**	**Category**	**Cr.**	**L**	**T**	**P**	**Int. Marks**	**Ext. Marks**	**Total Marks**
M19CST2201	**Dissertation-II / Industrial Project**	PR	16	0	0	32	--	100	100

SYLLABUS : DISSERTATION-II/INDUSTRIAL PROJECT (M19CST2201)

The student has to continue his/her work from Dissertation-I / Industrial project to complete Dissertation-II in IV semester.

Continuous assessment of Dissertation-II during IV-Semester will be monitored by the PRC.

Dissertation-II is evaluated for 100 external marks based on Review and Viva Voce.

Review and Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the Thesis. The Board shall jointly report the candidate's work for 100 marks.

If the report of the Viva-Voce is unsatisfactory (ie, < 50 marks), the candidate shall retake the Viva-Voce examination only after three months. If he fails to get a satisfactory report at the second Viva-Voce examination, the candidate has to reregister for the project and complete the project within the stipulated
time after taking the approval from the College

Regulation: R19	I / II - M.Tech. I - Semester

COMMUNICATION SYSTEMS
(Under Choice Based Credit System / Elective Course System)

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2019-20 admitted Batch onwards)

Course Code	Course Name	Category	Cr.	L	T	P	Int. Marks	Ext. Marks	Total Marks
M19CS1101	Digital Data Communications	PC	3	3	0	0	25	75	100
M19CS1102	Advanced Digital Signal Processing	PC	3	3	0	0	25	75	100
#PE-I	Program Elective-I	PE	3	3	0	0	25	75	100
#PE-II	Program Elective-II	PE	3	3	0	0	25	75	100
M19RD1101	Research Methodology andIPR	CC	2	2	0	0	25	75	100
M19CS1109	Data CommunicationsLab	PC	2	0	0	4	25	75	100
M19CS1110	Advanced Digital Signal Processing Lab	PC	2	0	0	4	25	75	100
#AC-1	Audit course -1	AC	0	2	0	0	0	0	0
		Total	**18**	**16**	**0**	**8**	**175**	**525**	**700**

	Code	Course		Code	Course
#PE-I	M19CS1103	Radar Signal Processing	**# AC 1 & 2**	M19AC0001	English for Research Paper Writing
	M19CS1104	RF Circuit Design		M19AC0002	Disaster Management
	M19CS1105	Advanced Computer Networks		M19AC0003	Sanskrit for Technical Knowledge
#PE-II	M19CS1106	Wireless LANs and PANs		M19AC0004	Value Education
	M19CS1107	Mobile Computing Technologies		M19AC0005	Constitution of India
	M19CS1108	Network Security & Cryptography		M19AC0006	Pedagogy Studies
				M19AC0007	Stress Management by Yoga
				M19AC0008	Personality Development through Life Enlightenment Skills.

COMMUNICATION SYSTEMS

SYLLABUS: DIGITAL DATA COMMUNICATIONS (M19CS1101)

UNIT-I : Digital Modulation Schemes:

BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK – Methods, Bandwidth Efficiency,Carrier Recovery, Clock Recovery.

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

Data Communication Networks, Protocols and Standards, UART, USB, Line Configuration, Topology, Transmission Modes, Digital Data Transmission, DTE-DCE interface, Categories of Networks – TCP/IP Protocol suite and Comparison with OSImodel.

UNIT-III: Error Correction: Types of Errors, Vertical Redundancy Check (VRC), LRC, CRC,Checksum, Error Correction using Hamming code

Data Link Control: Line Discipline, Flow Control, Error Control

Data Link Protocols: Asynchronous Protocols, Synchronous Protocols, Character Oriented Protocols, Bit-Oriented Protocol, Link Access Procedures.

UNIT-IV: Multiplexing: Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Multiplexing Application, and DSL.

Local Area Networks: Ethernet, Other Ether Networks, Token Bus, Token Ring, FDDI. Metropolitan Area Networks: IEEE 802.6, SMDS

Switching: Circuit Switching, Packet Switching, Message Switching.

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

UNIT-V: Multiple Access Techniques:

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

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1101	
Course Title: DIGITAL DATA COMMUNICATIONS	
CO-1	Model digital communication system using appropriate mathematical techniques (error probability, constellation diagrams, phasor diagrams).
CO-2	Understanding the basic concepts of how digital data is transferred across computer networks.
CO-3	Independently understand basic computer network technology.
CO-4	Understand and explain Data Communications System and its components.
CO-5	Identify the different types of network topologies and protocols.
CO-6	Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
CO-7	Identify the different types of network devices and their functions within a network
CO-8	Understand and building the skills of sub netting and routing mechanisms.
CO-9	Familiarity with the basic protocols of computer networks, and how they can be used
CO-10	To assist in network design and implementation.

SYLLABUS: ADVANCED DIGITAL SIGNAL PROCESSING (M19CS1102)

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

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

UNIT-II: Applications of Multirate Signal Processing:

Design of Phase Shifters, Interfacing of Digital Systems with Different Sampling Rates, Implementation of Narrow Band Low Pass Filters, Implementation of Digital Filter Banks, Sub-band Coding of Speech Signals, Quadrature Mirror Filters, Trans-multiplexers, Oversampling A/D and D/A Conversion

UNIT-III: Non-Parametric Methods of Power Spectral Estimation: Estimation of spectra fromfinite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods.

UNIT-IV: Implementation of Digital Filters:

Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT-V: Parametric Methods of Power Spectrum Estimation: Autocorrelation & Its Properties, Relation between autocorrelation & model parameters, AR Models - Yule-Walker & Burg Methods, MA & ARMA models for power spectrum estimation, Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1102	
Course Title: ADVANCED DIGITAL SIGNAL PROCESSING	
CO-1	Design and implement the digital filters (both FIR & IIR).
CO-2	Describe sampling rate conversion and multirate signal processing in the digital domain.
CO-3	Apply the concepts of sampling rate conversion in the implementation of digital filter banks, quadrature mirror filters and their use in sub band coding.
CO-4	To understand the theory of forward-backward linear prediction filters and solution of normal equations.
CO-5	Understand Adaptive filtering and the concepts of nonparametric methods of power spectrum estimation.
CO-6	To know the applications based on DSP and multirate DSP.

SYLLABUS: RADAR SIGNAL PROCESSING (M19CS1103)

UNIT-I: Introduction:

Radar Block Diagram, Bistatic Radar, Monostatic Radar, Radar Equation, Information Available from Radar Echo. Review of Radar Range Performance– General Radar Range Equation, Radar Detection with Noise Jamming, Beacon and Repeater Equations, MTI and Pulse Doppler Radar.

Matched Filter Receiver – Impulse Response, Frequency Response Characteristic and its Derivation, Matched Filter and Correlation Function, Correlation Detection and Cross-Correlation Receiver, Efficiency of Non-Matched Filters, Matched Filter for Non-White Noise.

UNIT-II: Detection of Radar Signals in Noise:

Detection Criteria – Neyman-Pearson Observer, Likelihood-Ratio Receiver, Inverse Probability Receiver, Sequential Observer, Detectors–Envelope Detector, Logarithmic Detector, I/Q Detector. Automatic Detection-CFAR Receiver, Cell Averaging CFAR Receiver, CFAR Loss, CFAR Uses in Radar. Radar Signal Management–Schematics, Component Parts, Resources and Constraints

UNIT-III: Waveform Selection:

Radar Ambiguity Function and Ambiguity Diagram – Principles and Properties; Specific Cases – Ideal Case, Single Pulse of Sine Wave, Periodic Pulse Train, Single Linear FM Pulse, Noise Like Waveforms, Waveform Design Requirements, Optimum Waveforms for Detection in Clutter, Family of Radar Waveforms.

UNIT-IV: Pulse Compression in Radar Signals:

Introduction, Significance, Types, Linear FM Pulse Compression – Block Diagram, Characteristics, Reduction of Time Side lobes, Stretch Techniques, Generation and Decoding of FM Waveforms – Block Schematic and Characteristics of Passive System, Digital Compression, SAW Pulse Compression.

UNIT-V: Phase Coding Techniques:

Principles, Binary Phase Coding, Barker Codes, Maximal Length Sequences (MLS/LRS/PN), Block Diagram of a Phase Coded CW Radar.

Polyphase Codes : Frank Codes, Costas Codes, Non-Linear FM Pulse Compression, Doppler Tolerant PC Waveforms – Short Pulse, Linear Period Modulation (LPM/HFM), Side lobe Reduction for Phase Coded PC Signals.

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1103	
Course Title: RADAR SIGNAL PROCESSING	
CO-1	Understand the operation of Radar and characteristics of Matched filter for non- white noise.
CO-2	Understand the various detection criterion and types of detectors that can be used to detect the Radar signals in noise.
CO-3	Understand the waveform design requirements and optimum waveforms for the detection of signals in clutter.
CO-4	Know the significance and types of pulse compression techniques for analog and digital signals.
CO-5	Understand the requirements of phase coding in Radar and various Polyphase codes used for phase coding.

SYLLABUS: RF CIRCUIT DESIGN (M19CS1104)

UNIT-I: Introduction to RF Electronics:

The Electromagnetic Spectrum, units and Physical Constants, Microwave bands – RF behaviour of Passive components: Tuned resonant circuits, Vectors, Inductors and Capacitors - Voltage and Current in capacitor circuits – Tuned RF / IF Transformers.

UNIT-II: Transmission Line Analysis: Examples of transmission lines- Transmission line equations and Biasing- Micro Strip Transmission Lines- Special Termination Conditions- sourced and Loaded Transmission Lines. Single And Multiport Networks: The Smith Chart, Interconnectivity networks, Network properties and Applications, Scattering Parameters.

UNIT-III: Matching and Biasing Networks: Impedance matching using discrete components – Micro strip line matching networks, Amplifier classes of Operation and Biasing networks. RF Passive & Active Components: Filter Basics – Lumped filter design – DistributedFilter Design – Diplexer Filters- Crystal and Saw filters- Active Filters - Tunable filters –Power Combiners / Dividers – Directional Couplers – Hybrid Couplers – Isolators. RFDiodes – BJTs- FETs- HEMTs and Models.

UNIT-IV: RF Transistor Amplifier Design: Characteristics of Amplifiers - Amplifier Circuit Configurations, Amplifier Matching Basics, Distortion and noise products, Stability Considerations, Small Signal amplifier design, Power amplifier design, MMIC amplifiers, Broadband High Power multistage amplifiers, Low noise amplifiers, VGA Amplifiers.

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

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1104	
Course Title: RF CIRCUIT DESIGN	
CO-1	Understand the behavior of RF passive components and model active components.
CO-2	Perform transmission linear analysis.
CO-3	Demonstrate use of Smith Chart for high frequency circuit design.
CO-4	Justify the choice/selection of components from the design aspects.
CO-5	Contribute in the areas of RF circuit design.

SYLLABUS: ADVANCED COMPUTER NETWORKS (M19CS1105)

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

UNIT-II: X.25 Standards: X.25 Layers, X.21 Protocol ,**Frame Relay:** Introduction, Frame relay operation, Frame relay layers, Congestion control, Leaky Bucket algorithms, **ATM:** Design goals, ATM architecture, Switching, Switch Fabric, ATM layers, Service classes, ATM applications

UNIT-III: Interconnection Networks: Introduction, Banyan Networks, Properties, Crossbar switch,Three Stage Class networks, Rearrange able Networks, Folding algorithm, Benes Networks, Lopping algorithm, Bit allocation algorithm. **SONET/SDH**: Synchronous Transportsignals, Physical configuration, SONET layers, SONET Frame.

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

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

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1105	
Course Title: ADVANCED COMPUTER NETWORKS	
CO-1	Able to Define Congestion and Quality of Service and Illustrate reference models with layers, protocols and interfaces.
CO-2	Familiar with the basic protocols of computer networks, and how they can be used to assist in network design and implementation
CO-3	Understand the general principles behind , addressing, routing, reliable transmission and other stateful protocols
CO-4	Have an informed view of both the internal workings of the Internet and of a number of common Internet applications and protocols
CO-5	Familiar with the basic cellular concepts and understand the importance of multiple accessing schemes.

SYLLABUS: WIRELESS LANs AND PANs (M19CS1106)

UNIT-I: Wireless System & Random Access Protocols:

Introduction, First and Second Generation Cellular Systems, Cellular Communications from 1G to 3G, Wireless 4G systems, The Wireless Spectrum; Random Methods: Pure ALOHA, Slotted ALOHA, Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Detection (CSMA/CD), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA).

UNIT-II: Wireless LANs:

Introduction, importance of Wireless LANs, WLAN Topologies, Transmission Techniques: Wired Networks, Wireless Networks, comparison of wired and Wireless LANs; WLAN Technologies: Infrared technology, UHF narrowband technology, Spread Spectrumtechnology.

UNIT-III: The IEEE 802.11 Standard for Wireless LANs:

Network Architecture, Physical layer, The Medium Access Control Layer; MAC Layer issues: Hidden Terminal Problem, Reliability, Collision avoidance, Congestion avoidance, Congestion control, Security, The IEEE 802.11e MAC protocol.

UNIT-IV: Wireless PANs:

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

UNIT-V: The IEEE 802.15 Working Group for WPANs:

The IEEE 802.15.3, The IEEE 802.15.4, ZigBee Technology, ZigBee components and network topologies, The IEEE 802.15.4 LR-WPAN Device architecture: Physical Layer, Data Link Layer, The Network Layer, Applications; IEEE 802.15.3a Ultra wideband

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1106	
Course Title: WIRELESS LANs AND PANs	
CO-1	Able to study the different generations of mobile networks.
CO-2	Able to understand the concepts of Wireless LANS.
CO-3	Able to understand the wireless networking IEEE 802.11 for WLAN.
CO-4	Able to understand the concepts of different wireless personal area networks
CO-5	Able to study different working group of IEEE 802.15 standards for WLAN.

SYLLABUS: MOBILE COMPUTING TECHNOLOGIES (M19CS1107)

UNIT-I: Introduction to Mobile Computing Architecture:

Mobile Computing – Dialog Control – Networks – Middleware and Gateways – Application and Services – Developing Mobile Computing Applications – Security in Mobile Computing – Architecture for Mobile Computing – Three Tier Architecture –Design considerations for Mobile Computing – Mobile Computing through Internet –Making existing Applications Mobile Enabled.

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

Bluetooth – Radio Frequency Identification – Wireless Broadband – Mobile IP – Internet Protocol Version 6 (IPv6) – Java Card – GSM Architecture – GSM Entities – Call Routing in GSM – PLMN Interfaces – GSM addresses and Identifiers – Network aspects in GSM – Authentication and Security – Mobile computing over SMS – GPRS and Packet Data Network – GPRS Network Architecture – GPRS Network Operations – Data Services in GPRS – Applications for GPRS – Limitations of GPRS – Spread Spectrum technology – Is-95 – CDMA Versus GSM – Wireless Data – Third Generation Networks – Applications on 3G

UNIT-III: Wireless Application Protocol (WAP) and Wireless LAN:

WAP – MMS – Wireless LAN Advantages – IEEE 802.11 Standards – Wireless LAN Architecture – Mobility in wireless LAN Intelligent Networks and Interworking:

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

UNIT-IV: Client Programming, Palm OS, Symbian OS, Win CE Architecture:

Introduction – Moving beyond the Desktop – A Peek under the Hood: Hardware Overview – Mobile phones – PDA – Design Constraints in Applications for Handheld Devices – Palm OS architecture – Application Development – Multimedia – Symbian OS Architecture – Applications for Symbian, Different flavors of Windows CE -Windows CE Architecture.

J2ME:JAVA in the Handset – The Three-prong approach to JAVA Everywhere – JAVA 2 Micro Edition (J2ME) technology – Programming for CLDC – GUI in MIDP – UI Design Issues – Multimedia – Record Management System – Communication in MIDP – Security considerations in MIDP – Optional Packages

UNIT-V: Voice Over Internet Protocol and Convergence:

Voice over IP- H.323 Framework for Voice over IP – Session Initiation Protocol – Comparison between H.323 and SIP – Real Time protocols – Convergence Technologies – Call Routing – Voice over IP Applications – IP multimedia subsystem (IMS) – Mobile VoIP

Security Issues in Mobile Computing: Introduction – Information Security – Security Techniques and Algorithms – Security Protocols– Public Key Infrastructure – Trust – Security Models – Security frameworks for Mobile Environment

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1107	
Course Title: MOBILE COMPUTING TECHNOLOGIES	
CO-1	Apply advanced data communication methods and networking protocols for wireless and mobile environments
CO-2	Utilize and employ application frameworks for developing mobile applications including under disconnected and weakly connected environment
CO-3	Create web sites suitable for mobile environments
CO-4	Select components and networks for particular application
CO-5	Creatively analyse mobile and wireless networks
CO-6	Critically analyse security issues of mobile and wireless computing systems

SYLLABUS: NETWORK SECURITY & CRYPTOGRAPHY (M19CS1108)

UNIT-I: Introduction:

Attacks, Services and Mechanisms, Security attacks, Security services, A Model for Internetwork security. Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques.
Modern Techniques:
Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations.

UNIT-II: Encryption Algorithms:

Triple DES, International Data Encryption algorithm, Blowfish, RC5, CAST-128, RC2, Characteristics of Advanced Symmetric block ciphers. Conventional Encryption : Placement of Encryption function, Traffic confidentiality, Key distribution, RandomNumber Generation.

UNIT-III: Public Key Cryptography:

Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography. Number Theory: Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms.

UNIT-IV: Message Authentication and Hash Functions: Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.
Hash and Mac Algorithms: MD File, Message digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC. Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards.
Authentication Applications: Kerberos, X.509 directory Authentication service. Electronic Mail Security: Pretty Good Privacy, S/MIME.

UNIT-V: IP Security: Overview, Architecture, Authentication, Encapsulating Security Payload, Combining security Associations, Key Management. Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction. Intruders, Viruses and Worms: Intruders, Viruses and Related threats.Fire Walls: Firewall Design Principles, Trusted systems.

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1108	
Course Title: NETWORK SECURITY & CRYPTOGRAPHY	
CO-1	Identify and utilize different forms of cryptography techniques.
CO-2	Incorporate authentication and security in the network applications.
CO-3	Distinguish among different types of threats to the system and handle the same.
CO-4	To become familiar with Security issues in Electronic transaction.

SYLLABUS: RESEARCH METHODOLOGY AND IPR (M19RD1101)

UNIT-I: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT-II: Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format ofresearch proposal, a presentation and assessment by a review committee

UNIT-III: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents,Patenting under PCT.

UNIT-IV: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT-V: New Developments in IPR: Administration of Patent System. New developments in IPR;IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1110	
Course Title: ADVANCED COMPUTER NETWORKS	
CO-1	Analyze research related information
CO-2	Formulate a Research Proposals and Publish papers with research ethics
CO-3	Award for Intellectual Property Rights like Patents, Trade and Copyrights
CO-4	Analyze Various Intellectual Property Rights

SYLLABUS: DATA COMMUNICATIONS LAB (M19CS1109)

List of Experiments

1. Study of serial interface RS – 232
2. Study of pc to pc communication using parallel port
3. To establish pc-pc communication using LAN
4. Study of LAN using star topology, bus topology and tree topology
5. Study and configure modem of a computer
6. To configure a hub/switch
7. To study the interconnections of cables for data communication
8. Study of a wireless communication system
9. Set up of time division multiplexing using fiber optics
10. Digital Fibre Optical Transmitter and Receiver

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1109	
Course Title: DATA COMMUNICATIONS LAB	
CO-1	Students can identify the type of fibre optical cable and test their applications
CO-2	Understand the fundamental concepts of data communications and networking
CO-3	Identify different components and their respective roles in a computer communication system.
CO-4	Acquaint them-selves with networking simulation tools, configuring of networking devices and understand their functionality.

SYLLABUS: ADVANCED DIGITAL SIGNAL PROCESSING LAB (M19CS1110)

LIST OF EXPERIMENTS

1. Basic Signal Representation
2. Correlation Auto And Cross
3. Stability Using Hurwitz Routh Criteria
4. Sampling FFT Of Input Sequence
5. Butterworth Low pass And High pass Filter Design
6. Chebychev Type I,II Filter
7. State Space Matrix from Differential Equation
8. Normal Equation Using Levinson Durbin
9. Decimation And Interpolation Using Rational Factors
10. Maximally Decimated Analysis DFT Filter
11. Cascade Digital IIR Filter Realization
12. Convolution And M Fold Decimation & PSD Estimator
13. Estimation Of PSD
14. Inverse Z Transform
15. Group Delay Calculation
16. Separation of T/F
17. Parallel Realization of IIR filter

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1110	
Course Title: ADVANCED DIGITAL SIGNAL PROCESSING LAB	
CO-1	Design different digital filters in software
CO-2	Apply various transforms in time and frequency
CO-3	Perform decimation and interpolation

SYLLABUS: ENGLISH FOR RESEARCH PAPER WRITING (M19AC0001)

UNIT-I: Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity andVagueness

UNIT-II: Clarifying Who Did What, Highlighting Your Findings, Hedging And Criticizing, Paraphrasing and Plagiarism, Sections of a Paper.

UNIT-III: Abstracts, Introduction, Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-IV: Key skills are needed when writing a Title, key skills are needed when writing an abstract, key skills are needed when writing an introduction, skills needed when writing a Review of the Literature, skills are needed when writing the Methods.

UNIT-V: Skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions, useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1110	
Course Title: ADVANCED COMPUTER NETWORKS	
CO-1	Understand that how to improve your writing skills and level of readability
CO-2	Learn about what to write in each section
CO-3	Understand the skills needed when writing a Title Ensure the good quality of paper at very first time submission

SYLLABUS: DISASTER MANAGEMENT (M19AC0002)

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

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

UNIT-III: Disaster Prone Areas In India: Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics.

UNIT-IV: Disaster Preparedness And Management

Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation OfRisk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

UNIT-V: Risk Assessment

Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And NationalDisaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

Disaster Mitigation

Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0002	
Course Title: DISASTER MANAGEMENT	
CO-1	Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO-2	Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO-3	Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO-4	Critically understand the strengths and weaknesses of disaster management approaches, planning & programming in different countries, particularly their home country or the countries they work in.

SYLLABUS: SANSKRIT FOR TECHNICAL KNOWLEDGE (M19AC0003)

UNIT-I: Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

UNIT-II: Order, Introduction of roots, Technical information about Sanskrit Literature

UNIT-III: Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1110	
Course Title: ADVANCED COMPUTER NETWORKS	
CO-1	Understanding basic Sanskrit language.
CO-2	Ancient Sanskrit literature about science & technology can be understood.
CO-3	Being a logical language will help to develop logic in students.

SYLLABUS: VALUE EDUCATION (M19AC0004)

UNIT-I: Values and self-development –Social values and individual attitudes. Work ethics, Indianvision of humanism. Moral and non- moral valuation. Standards and principles. Value judgments.

UNIT-II: Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, NationalUnity, Patriotism, Love for nature , Discipline.

UNIT-III: Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free fromanger, Dignity of labor. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits.Association and Cooperation, Doing best for saving nature

UNIT-IV: Character and Competence –Holy books vs Blind faith. Self-management and Good health.Science of reincarnation. Equality, Nonviolence ,Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studyingeffectively.

Course Outcomes for First Year First Semester Course	
Course Code: M19CST1110	
Course Title: ADVANCED COMPUTER NETWORKS	
CO-1	Knowledge of self-development
CO-2	Learn the importance of Human values
CO-3	Developing the overall personality

SYLLABUS: CONSTITUTION OF INDIA (M19AC0005)

UNIT-I: History of Making of the Indian Constitution: History , Drafting Committee, (Composition & Working)

UNIT-II: Philosophy of the Indian Constitution: Preamble, Salient Features

UNIT-III: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights ,Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT-IV: Organs of Governance:
Parliament, Composition, Qualifications and Disqualifications ,Powers and Functions, Executive, President , Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions
Local Administration:
District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zilla Panchayat. Elected officials and their roles, CEO Zilla Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments),Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT-V: Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0005	
Course Title: CONSTITUTION OF INDIA	
CO-1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO-2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
CO-3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure ofthe proposal of direct elections through adult suffrage in the Indian Constitution.
CO-4	Discuss the passage of the Hindu Code Bill of 1956.

SYLLABUS: PEDAGOGY STUDIES (M19AC0006)

UNIT-I: Introduction and Methodology:

Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions.
Overview of methodology and Searching.

UNIT-II: Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries, Curriculum, Teacher education.

UNIT-III: Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage:quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effectivepedagogy.

UNIT-IV: Theory of change, Strength and nature of the body of evidence for effective pedagogical practices Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies. Professional development: alignment with classroom practices and follow-up support

UNIT-V: Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0006	
Course Title: PEDAGOGY STUDIES	
CO-1	Illustrate reference models with layers, protocols and interfaces.
CO-2	Describe Sub netting and Addressing of IP V4andIPV6.
CO-3	Describe and Analysis of basic protocols of computer networks, and how they can be used to assist in network design and implementation.
CO-4	Discuss the concepts of congestion control and quality of service
CO-5	Demonstrate Data Communications System and its components.

SYLLABUS: STRESS MANAGEMENT BY YOGA (M19AC0007)

UNIT-I: Definitions of Eight parts of yoga (Ashtanga)

UNIT-II: Yam and Niyam.

Do's and Don'ts in life.

i) Ahinsa, satya, astheya, brahmacharya and aparigraha

ii) Shaucha, santosh, tapa, swadhyay, ishvarapranidhana

UNIT-III: Asan and Pranayam

i) Various yoga poses and their benefits for mind & body

ii) Regularization of breathing techniques and its effects-Types pranayama

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0007	
Course Title: STRESS MANAGEMENT BY YOGA	
CO-1	Develop a healthy mind in a healthy body thus improving social health also.
CO-2	Improve efficiency

SYLLABUS: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS (M19AC0008)

UNIT-I: Neetisatakam-Holistic development of personality
Verses- 19,20,21,22 (wisdom), Verses- 29,31,32 (pride & heroism)
Verses- 26,28,63,65 (virtue),Verses- 52,53,59 (don'ts),Verses- 71,73,75,78 (do's).

UNIT-II: Approach to day to day work and duties. ShrimadBhagwadGeeta : Chapter 2-Verses: 41, 47,48
Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, Chapter 18-Verses 45, 46, 48.

UNIT-III: Statements of basic knowledge, Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68, Chapter 12 -Verses 13, 14, 15, 16,17, 18, Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39, Chapter18 – Verses 37,38,63

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0008	
Course Title: PERSONALITY DEVELOPMENT THROUGH LIFEENLIGHTENMENT SKILLS	
CO-1	Study of Shrimad – Bhagwad - Geeta will help the student in developing his personality and achieve the highest goal in life.
CO-2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity.
CO-3	Study of Neetishatakam will help in developing versatile personality of students.

Regulation: R19	**I / II - M.Tech. II - Semester**

COMPUTER SCIENCE & TECHNOLOGY
(Under Choice Based Credit System / Elective Course System)

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2019-20 admitted Batch onwards)

Course Code	Course Name	Category	Cr.	L	T	P	Int. Marks	Ext. Marks	Total Marks
M19CS1201	Wireless Communications andNetworks	PC	3	3	0	0	25	75	100
M19CS1202	Image and Video Processing	PC	3	3	0	0	25	75	100
#PE-III	Elective-III	PE	3	3	0	0	25	75	100
#PE-IV	Elective-IV	PE	3	3	0	0	25	75	100
M19CS1209	Advanced Communications Lab	PC	2	0	0	4	25	75	100
M19CS1210	Advanced Digital Image and Video Processing Laboratory	PC	2	0	0	4	25	75	100
M19CS1211	Mini Project with Seminar	PC	2	0	0	4	100	0	100
#AC-2	Audit Course 2	AC	0	2	0	0	0	0	0
Total			**18**	**14**	**0**	**12**	**250**	**450**	**700**

	Code	Course
#PE-III	M19 CS 1203	Soft Computing Techniques
	M19 CS 1204	Internet Protocols
	M19 CS 1205	Cyber Security
#PE-IV	M19 CS 1206	Optical Networks
	M19 CS 1207	Digital Signal Processors and Architectures
	M19 CS 1208	Radio Navigational Aids

SYLLABUS: WIRELESS COMMUNICATIONS AND NETWORKS (M19CS1201)

UNIT-I: The Cellular Concept-System Design Fundamentals:

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

UNIT-II: Mobile Radio Propagation: Large-Scale Path Loss:

Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, Basic Propagation Mechanisms, Reflection: Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two-Ray) Model, Diffraction: Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models- Longley-Ryce Model, OkumuraModel, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

UNIT-III: Mobile Radio Propagation: Small –Scale Fading and Multipath

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

UNIT-IV: Equalization and Diversity

Introduction, Fundamentals of Equalization, Training a Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non-linear Equalization- Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity - Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE

Receiver.

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

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1201	
Course Title: WIRELESS COMMUNICATIONS AND NETWORKS	
CO-1	At the end of this course the student will be able to:
CO-2	Understand Cellular communication concepts
CO-3	Study the mobile radio propagation
CO-4	Study the wireless networks and different types of MAC protocols

SYLLABUS: IMAGE AND VIDEO PROCESSING (M19CS1202)

UNIT-I: Fundamentals of Image Processing and Image Transforms:

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

UNIT-II: Image Enhancement:

Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters. Frequency domain methods: Basics offiltering in frequency domain, image smoothing, image sharpening, Selective filtering.

Image Restoration:

Introduction to Image restoration, Image degradation, Types of image blur, Classificationof image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind deconvolution.

UNIT-III: Image Segmentation: Introduction to image segmentation, Point, Line and Edge Detection,Region based segmentation., Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding,Edge based segmentation, Edge detection and linking, Hough transform, Active contour Image Compression: Introduction, Need for image compression, Redundancy in images, Classification of redundancy in images, image compression scheme, Classification of imagecompression schemes, Fundamentals of information theory, Run length coding, Shannon –Fano coding, Huffman coding, Arithmetic coding, Predictive coding, Transformed basedcompression, Image compression standard, Wavelet-based image compression, JPEG Standards.

UNIT-IV: Basic Steps of Video Processing:

Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, Filtering operations.

UNIT-V: 2-D Motion Estimation:

Optical flow, General Methodologies, Pixel Based Motion Estimation, Block- MatchingAlgorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Videocoding.

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1202	
Course Title: IMAGE AND VIDEO PROCESSING	
CO-1	Defining the digital image, representation of digital image, importance of image resolution, applications in image processing.
CO-2	Know the advantages of representation of digital images in transform domain, application of various image transforms
CO-3	Know how an image can be enhanced by using histogram techniques, filtering techniques etc.
CO-4	Understand image degradation, image restoration techniques using spatial filters and frequency domain
CO-5	Know the detection of point, line and edges in images, edge linking through local processing, global processing.
CO-6	Understand the redundancy in images, various image compression techniques.
CO-7	Know the video technology from Analog colour TV systems to digital video systems, how video signal is sampled and filtering operations in video processing.
CO-8	Know the general methodologies for 2D motion estimation, various coding used in video processing

SYLLABUS: SOFT COMPUTING TECHNIQUES (M19CS1203)

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

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

UNIT-III: Fuzzy Logic System: Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modelling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modelling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear time delay system.

UNIT-IV: Genetic Algorithm: Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and ant-colony search techniques for solving optimization problems.

UNIT-V: Applications: GA application to power system optimisation problem, Case studies: Identification and control of linear and nonlinear dynamic systems using MATLAB-Neural Network toolbox, Stability analysis of Neural Network interconnection systems, Implementation of fuzzy logic controller using MATLAB fuzzy-logic toolbox, Stability analysis of fuzzy control systems.

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1203	
Course Title: SOFT COMPUTING TECHNIQUES	
CO-1	Understand the basic concepts of Artificial neural network systems.
CO-2	Understand the McCulloch-Pitts neuron model, simple and multilayer Perception, Adeline and Madeline concepts
CO-3	Data processing, Hopfield and self-organizing network.
CO-4	Difference between crisp sets to fuzzy sets, fuzzy models, fuzzification, inference, membership functions, rule based approaches and defuzzification.
CO-5	Self – organizing fuzzy logic control, nonlinear time delay systems.
CO-6	Understand the concept of Genetic Algorithm steps. Tabu, ant-colony search techniques for solving optimization problems.
CO-7	GA applications to power system optimization problems, identification andcontrol of linear and nonlinear dynamic systems using MATLAB-Neural network toolbox.
CO-8	Know the application and importance of stability analysis

SYLLABUS: INTERNET PROTOCOLS (M19CS1204)

UNIT-I: Internetworking Concepts:

Principles of Internetworking, Connectionless Internetworking, Application level Interconnections, Network level Interconnection, Properties of the Internet, Internet Architecture, Wired LANS, Wireless LANs, Point-to-Point WANs, Switched WANs, Connecting Devices, TCP/IP Protocol Suite.

IP Address:

Class full Addressing: Introduction, Class full Addressing, Other Issues, Sub-netting and Super-netting Classless Addressing: Variable length Blocks, Sub-netting, Address Allocation. Delivery, Forwarding, and Routing of IP Packets: Delivery, Forwarding, Routing, Structure of Router. ARP and RARP: ARP, ARP Package, RARP.

UNIT-II: Internet Protocol (IP):

Datagram, Fragmentation, Options, Checksum, IP V.6.

Transmission Control Protocol (TCP):

TCP Services, TCP Features, Segment, A TCP Connection, State Transition Diagram, Flow Control, Error Control, Congestion Control, TCP Times.

Stream Control Transmission Protocol (SCTP):

SCTP Services, SCTP Features, Packet Format, Flow Control, Error Control, CongestionControl.

Mobile IP:

Addressing, Agents, Three Phases, Inefficiency in Mobile IP.

Classical TCP Improvements:

Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit/ Fast Recovery, Transmission/Time Out Freezing, Selective Retransmission, Transaction Oriented TCP.

UNIT-III: Unicast Routing Protocols (RIP, OSPF, and BGP):

Intra and Inter-domain Routing, Distance Vector Routing, RIP, Link State Routing, OSPF, Path Vector Routing, BGP.

Multicasting and Multicast Routing Protocols:

Unicast - Multicast- Broadcast, Multicast Applications, Multicast Routing, Multicast LinkState Routing: MOSPF, Multicast Distance Vector: DVMRP.

UNIT-IV: Domain Name System (DNS): Name Space, Domain Name Space, Distribution of NameSpace, and DNS in the internet.

Remote Login TELNET:Concept, Network Virtual Terminal (NVT). File Transfer FTP and TFTP: File Transfer Protocol (FTP).

Electronic Mail: SMTP and POP.

Network Management-SNMP: Concept, Management Components, World Wide Web-HTTP Architecture.

UNIT-V: Multimedia:

Digitizing Audio and Video, Network security, security in the internet firewalls. Audio and Video Compression, Streaming Stored Audio/Video, Streaming Live Audio/Video, Real- Time Interactive Audio/Video, RTP, RTCP, Voice Over IP. Network Security, Security in the Internet, Firewalls.

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1204	
Course Title: INTERNET PROTOCOLS	
CO-1	Understanding basic network routing concepts and algorithms
CO-2	Understanding how to apply them into given topologies
CO-3	Understanding how the Internet protocol suite operates and describe the functions of various protocols
CO-4	Explain the concept and usage of node addressing and classify addresses into network layers.

SYLLABUS: CYBER SECURITY (M19CS1205)

UNIT-I: Introduction:

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

UNIT-II: Conventional Encryption:

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

UNIT-III: Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder theorem, Discrete logarithms

Public key: Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service

UNIT-IV: IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management

Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET)

Email Privacy: Pretty Good Privacy (PGP) and S/MIME.

UNIT-V: Intrusion Detection: Intruders, Intrusion Detection systems, Password Management.

Malicious Software: Viruses and related threats & Countermeasures.

Fire walls: Firewall Design principles, Trusted Systems.

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1205	
Course Title: CYBER SECURITY	
CO-1	Understand Cyber Security architecture principles
CO-2	Identify System and application security threats and vulnerabilities
CO-3	Identify different classes of attacks
CO-4	Cyber Security incidents to apply appropriate response
CO-5	Describing risk management processes and practices
CO-6	Evaluation of decision making outcomes of Cyber Security scenario

SYLLABUS: OPTICAL NETWORKS (M19CS1206)

UNIT-I: Client Layers of Optical Networks:

SONET / SDH – Multiplexing, Frame Structure, Physical Layer, Infrastructure, ATM – Functions, Adaptation layers, QoS, Flow Control Signaling and Routing, IP – Routing, QoS, MPLS, Storage Area Networks – ESCON, Fiber Channel, HIPPI, Gigabit Ethernet.

UNIT-II: WDM network Elements and Design:

Optical Line Terminals and Amplifiers, Add/Drop Multiplexers, Optical Cross Connects, Cost trade-offs in Network Design, LTD and RWA Problems, Dimensioning – Wavelength Routing Networks, Statistical and Maximum Load Dimensioning Models.

UNIT-III: Network Control and Management:

Network Management Functions, Optical Layer Services and Interfacing, Layers within Optical Layer, Multivendor Interoperability, Performance and Fault Management, Configuration Management, Optical Safety.

UNIT-IV: Network Survivability:

Basic Concepts of Survivability, Protection in SONET/SDH Links and Rings, Protection in IP Networks, Optical Layer Protection – Service Classes, Protection Schemes, Interworking betweenLayers.

UNIT-V: Access Networks and Photonic Packet Switching:

Network Architecture, Enhanced HFC, FTTC, Photonic Packet Switching – OTDM, Synchronization, Header Processing, Buffering, Burst Switching, Test Beds.

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1206	
Course Title: OPTICAL NETWORKS	
CO-1	Able to Contribute in the areas of optical network and WDM network design.
CO-2	Able to Implement simple optical network and understand further technology developments for future enhanced network.

SYLLABUS: DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES (M19CS1207)

UNIT-I: Introduction to Digital Signal Processing:

Introduction, A Digital signal-processing system, The sampling process, Discrete timesequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.

Computational Accuracy in DSP Implementations:

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

UNIT-II: Architectures for Programmable DSP Devices:

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT-III: Programmable Digital Signal Processors:

Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline operation of TMS320C54XX Processors.

UNIT-IV: Analog Devices Family of DSP Devices:

Analog Devices Family of DSP Devices – ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor.

Introduction to Black fin Processor - The Black fin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

UNIT-V: Interfacing Memory and I/O Peripherals to Programmable DSP Devices:

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1207	
Course Title: DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES	
CO-1	Identify and formalize architectural level characterization of P-DSP hardware
CO-2	Ability to design, programming (assembly and C), and testing code using Code Composer Studio environment
CO-3	Deployment of DSP hardware for Control, Audio and Video Signal processing applications
CO-4	Understanding of major areas and challenges in DSP based embedded systems.

SYLLABUS: RADIO NAVIGATIONAL AIDS (M19CS1208)

UNIT-I: Navigational Systems:

Review of Navigational Systems: Aircraft navigational system, Geometry of the earth. Navigation equation, Navigation errors, Radio navigation system types and Performance parameters, ILS System, Hyperbolic navigation systems, Loran, Omega, Decca Radio direction finding, DME, TACAN and VORTAC.

UNIT-II: Inertial Navigation:

Inertial navigation system ,Sensing instruments: Accelerometer. Gyro- copes, Analytic andGimbaled platforms, Mechanization, Error analysis, Alignment.

UNIT-III: Global Positioning System (GPS) for Navigation:

Overview of GPS, Reference systems ,Satellite orbits, Signal structure, Geometric dilution of precision (GDOP), or Precision dilution of recision (PDOP), Satellite ephemeris, Satellite clock, Ionospheric group delay ,Tropospheric group delay, Multipath errors and Receiver measurement errors.

UNIT-IV: Differential GPS and WAAS:

Standard and precise positioning service local area DGPS and Wide area DGPS errors, Wide Area Augmentation System (WAAS) architecture, Link budget and Data Capacity, Ranging function, Precision approach and error estimates.

UNIT-V: GPS Navigational Applications:

General applications of GPS, DGPS, Marine, Air and Land Navigation, Surveying,Mapping and Geographical information systems, Military and Space

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1208	
Course Title: RADIO NAVIGATIONAL AIDS	
CO-1	Acquire knowledge about Navigational systems
CO-2	Analyse the concepts of GPS and its applications in Navigation
CO-3	Foster ability to work using Instrument Landing System.
CO-4	Acquire knowledge about Satellite Navigation System.

SYLLABUS: ADVANCED COMMUNICATIONS LAB (M19CS1209)

NOTE:

A. Minimum of 10 Experiments have to be conducted

B. All Experiments may be Simulated using MATLAB and to be verified using related trainingkits

LIST OF EXPERIMENTS

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

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1209	
Course Title: ADVANCED COMMUNICATIONS LAB	
CO-1	Apply the concepts of measurement of bit error rate, Hamming distance and coding techniques.
CO-2	Simulate and calculate efficiency of spread spectrum techniques.
CO-3	Implement filter response on DSP trainer kit.
CO-4	Analyse the characteristics of Optical Fibre and Laser Diode.

SYLLABUS: ADVANCED DIGITAL IMAGE AND VIDEO PROCESSING LABORATORY (M19CS1210)

LIST OF EXPERIMENTS

1. Perform basic operations on images like addition, subtraction etc.
2. Plot the histogram of an image and perform histogram equalization
3. Implement segmentation algorithms
4. Perform video enhancement
5. Perform video segmentation
6. Perform image compression using lossy technique
7. Perform image compression using lossless technique
8. Perform image restoration
9. Convert a colour model into another
10. Calculate boundary features of an image
11. Calculate regional features of an image
12. Detect an object in an image/video using template matching/Bayes classifier

Course Outcomes for First Year First Semester Course	
Course Code: M19CS1210	
Course Title: ADVANCED DIGITAL IMAGE AND VIDEO PROCESSING LABORATORY	
CO-1	Perform image and video enhancement
CO-2	Perform image and video segmentation
CO-3	Detect an object in an image/video

SYLLABUS: MINI PROJECT WITH SEMINAR (M19CS1211)

For Mini Project with Seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Project Review Committee consisting of Head of the Department, supervisor/mentor and two other senior faculty members of the department.For Mini Project with Seminar, there will be only internal evaluation of 100 marks.A candidate has to secure a minimum of 50% of marks to be declared successful.

SYLLABUS: AUDIT COURSE-2 (#AC-2)

List of Audit Courses and their Syllabi are mentioned in the First Semester Syllabus.

The students can opt any one course for AC 2 from the list mentioned in first semester by not opting the course which is already taken for AC 1

Regulation: R19									II / II - M.Tech. I - Semester
COMMUNICATION SYSTEMS (Under Choice Based Credit System / Elective Course System)									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2019-20 admitted Batch onwards)									
Course Code	**Course Name**	**Category**	**Cr.**	**L**	**T**	**P**	**Int. Marks**	**Ext. Marks**	**Total Marks**
#PE-V	Program Elective	PE	3	3	--	--	25	75	100
#OE-I	Open Elective	OE	3	3	--	--	25	75	100
M19CS2106	**Dissertation-I /Industrial Project**	PR	10	--	---	20	50	50	100
Total			**16**	**6**	**0**	**20**	**100**	**200**	**300**

	Code	Course
#PE-V/ MOOCS	M19CS2101	Detection and Estimation Theory
	M19CS2102	Coding Theory and Applications
	M19CS2103	Software Defined Radio
	M19CS2104 (MOOCS-I)	Students Going for Industrial Project / Thesis will complete thesecourses through MOOCS. Students can also choose SWAYAM or NPTEL with a 12 weeks' course duration in PG level with 3 credits, butthe chosen subject should not be covered in their M. Tech Course
#OE-I/ MOOCS	#OE-I	Students have to choose one open elective course offered bydepartments other than the parent department. List of open Electives offered by other departments are enclosed.
	M19CS2105 (MOOCS-II)	Students Going for Industrial Project / Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a 12 weeks' course duration in PG level with 3 credits, but the chosen subject should not be covered in their M. Tech Course

OPEN ELECTIVES OFFERED TO OTHER DEPARTMENTS	
Code	**Course**
M19CS2107	Signals and systems
M19CS2108	Principles of Communication
M19CS2109	Image and video Processing

DETECTION AND ESTIMATION THEORY

COMMUNICATION SYSTEMS

SYLLABUS: DETECTION AND ESTIMATION THEORY (M19CS210)

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

UNIT-II : Detection Theory: Basic Detection Problem, Maximum A posteriori Decision Rule, Minimum Probability of Error Classifier, Bayes Decision Rule, Multiple-Class Problem (Bayes)- minimum probability error with and without equal a priori probabilities, Neyman- Pearson Classifier, General Calculation of Probability of Error, General Gaussian Problem, Composite Hypotheses

UNIT-III: Linear Minimum Mean-Square Error Filtering: Linear Minimum Mean Squared Error Estimators, Nonlinear Minimum Mean Squared Error Estimators. Innovations, Digital Wiener Filters with Stored Data, Real-time Digital Wiener Filters, and Kalman Filters.

UNIT-IV: Statistics: Measurements, Nonparametric Estimators of Probability Distribution and DensityFunctions, Point Estimators of Parameters, Measures of the Quality of Estimators, Introduction to Interval Estimates, Distribution of Estimators, Tests of Hypotheses, Simple Linear Regression, Multiple Linear Regression.

UNIT-V: Estimating the Parameters of Random Processes from Data: Tests for Stationarity andErgodicity, Model-free Estimation, Model-based Estimation of Autocorrelation Functions, Power Special Density Functions.

Course Outcomes for First Year First Semester Course	
Course Code: M19CS2101	
Course Title: DETECTION AND ESTIMATION THEORY	
CO-1	Understand the basic concepts of signal detection and estimation
CO-2	Understand different hypotheses in detection and estimation problems
CO-3	Understand the conceptual basics of detection and estimation of signals in white and non-white Gaussian noise
CO-4	Understand the detection of random signals
CO-5	Understand the time varying waveform detection and its estimation

SYLLABUS: CODING THEORY AND APPLICATIONS (M19CS2102)

UNIT-I : Coding for Reliable Digital Transmission and Storage:

Mathematical model of Information, A Logarithmic Measure of Information, Average Mutual Information and Entropy, Types of Errors, Error Control Strategies.

Linear Block Codes:

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

UNIT-II : Cyclic Codes:

Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes, Shortened cyclic codes.

UNIT-III: Convolutional Codes:

Encoding of Convolutional Codes, Structural and Distance Properties of Convolutional codes, maximum likelihood decoding, Sequential decoding, Majority-logic decoding of Convolution codes, Applications of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT-IV: Burst –Error-Correcting Codes:

Decoding of Single-Burst Error Correcting Cyclic codes, Single – Burst – Error – Correcting Codes, Phased – Burst – Error – Correcting Codes, Burst – Error – Correcting Convolutional Codes, Bounds on Burst Error Correcting Capability, Interleaved Cyclic and Convolutional Codes.

UNIT-V: BCH- CODES

Binary Primitive BCH Codes – Decoding of BCH Codes – Syndrome Computation and Iterative Algorithms for finding the Error Location Polynomial, Error location polynomial for single and double error correction, Computation of Error Location Numbers and Error Correction.

Course Outcomes for First Year First Semester Course	
Course Code: M19CS2102	
Course Title: CODING THEORY AND APPLICATIONS	
CO-1	Analyze the information theoretic problems from various disciplines like computer science, mathematics, statistics and communication engineering.
CO-2	Apply coding techniques in various communication systems like wireless communications to achieve coding gain at low SNR values.
CO-3	Build new structures for encoder and decoder to address the issues in evaluating performance of communication system.
CO-4	Implement coding techniques in real time systems.
CO-5	Encode and decode information by applying algorithms associated with well- known codes.

SYLLABUS : SOFTWARE DEFINED RADIO (M19CS2103)

UNIT-I : Introduction:

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

UNIT-II : Multi Rate Signal Processing:

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

Digital Generation of Signals:

Introduction- Comparison of Direct Digital Synthesis with Analog Signal Synthesis- Approaches to Direct Digital Synthesis- Analysis of Spurious Signals- Spurious Components due to Periodic jitter- Band Pass Signal Generation- Performance of Direct Digital Synthesis Systems- Hybrid DDS-PLL Systems- Applications of direct Digital Synthesis- Generation of Random Sequences- ROM Compression Techniques.

UNIT-III: Analog to Digital and Digital to Analog Conversion:

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

UNIT-IV: Digital Hardware Choices:

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

UNIT-V: Object – Oriented Representation of Radios and Network Resources:

Networks- Object Oriented Programming- Object Brokers- Mobile ApplicationEnvironments-Joint Tactical Radio System. Case Studies in Software Radio Design: Introduction and Historical Perspective, SPEAK easy-JTRS, Wireless Information Transfer System, SDR-3000 Digital Transceiver Subsystem, Spectrum Ware, CHARIOT.

Course Outcomes for First Year First Semester Course	
Course Code: M19CS2103	
Course Title: SOFTWARE DEFINED RADIO	
CO-1	Understanding of analog RF components as front end block in implementation of SDR.
CO-2	Design circuits at different Multirate signaling technique for frequency conversion and Sampling issues.
CO-3	Understanding of ADC and DAC technology.
CO-4	Knowledge of Hardware and software development methods for embeddedwireless systems
CO-5	Make system-level decisions for software defined radio technology and products.

SYLLABUS: MOOCS-I (M19CS2104)

Students Going for Industrial Project / Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a 12 weeks' course duration in PG level with 3 credits, but the chosen subject should not be covered in their M. Tech Course.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)
(Affiliated to JNTUK, Kakinada),(Recognized by AICTE, NewDelhi) Accredited by NAAC with‘A’Grade
UG Programmes CE, CSE, ECE, EEE, IT & ME are Accredited by NBA
Estd:1980 ChinnaAmiram, Bhimavaram-534204. (AP)

SYLLABUS: OPEN ELECTIVE

Students have to choose one open elective course offered by departments other than the parent departments.
List of open Electives offered by other departments are given below.

Offered from	Course Code	Course Name	Offered to
CIVIL ENGINEERING	M19 ST 2107	Construction Management	**CST, CS, PSA,IT & CAD/CAM**
	M19 ST 2108	Green Technology	
	M19 ST 2109	Analysis of Offshore Structures	
COMPUTER SCIENCE & ENGINEERING	M19 CST 2106	Python Programming	**ST, CS, PSA & CAD/CAM**
	M19 CST 2107	Artificial Intelligence	
	M19 CST 2108	Advanced Data structures	
ELECTRICAL & ELECTRONICS ENGINEERING	M19PS2107	Electric And Hybrid Vehicles	**ST, CST, CS, IT & CAD/CAM**
	M19PS2108	Energy From Waste	
	M19PS2109	Energy Management and Auditing	
INFORMATION TECHNOLOGY	M19IT2108	Web Technologies	**ST, CS, PSA & CAD/CAM**
	M19IT2109	Internet of Things	
	M19IT2110	Machine Learning	
MECHNAICAL ENGINEERING	M19CAD 2107	Operations Research	**ST, CST, CS,PSA & IT**
	M19CAD 2108	Nano Technology	
	M19CAD 2109	Product Design & Manufacturing	
SCIENCE & HUMANITIES	M19BS2101	Management and OrganisationalBehaviour	**ST, CST, CS,PSA, IT & CAD/CAM**

SYLLABUS : MOOCS-II (M19CS2105)

Students Going for Industrial Project / Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a 12 weeks' course duration in PG level with 3 credits, but thechosen subject should not be covered in their M. Tech Course

SYLLABUS: DISSERTATION-I/INDUSTRIAL PROJECT (M19CS2106)

The Student has to register for Dissertation-I / Industrial project in III semester. Student has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work for approval. The student can initiate the Project work, only after obtaining the approval from the Project Review Committee (PRC).

Continuous assessment of Dissertation-I during the III-Semester will be monitored by the PRC. Dissertation-I/ Industrial Project is evaluated for 50 internal marks and 50 external marks.

Internal marks 50 awarded by Project Guide and PRC jointly based on continuous assessment consistingof two seminars based on Dissertation work-I.

External marks 50 awarded by External Examiner, Supervisor and Head of the Department jointly based on a review and Viva voce on Dissertation work-I.

Regulation: R19	I / II - M.Tech. I - Semester

ELECTRIC AND ELECTRONICS ENGINEERING (POWER SYSTEM &AUTOMATION)

(Under Choice Based Credit System / Elective Course System)

SCHEME OF INSTRUCTION & EXAMINATION

(With effect from 2019-20 admitted Batch onwards)

Course Code	Course Name	Category	Cr.	L	T	P	Int. Marks	Ext. Marks	Total Marks
M19 PS 1101	Advanced Power systemoperation and control	PC	3	3	0	0	25	75	100
M19 PS 1102	Power system dynamicsand stablity	PC	3	3	0	0	25	75	100
#PE-I	Program Elective-I	PE	3	3	0	0	25	75	100
#PE-II	Program Elective-II	PE	3	3	0	0	25	75	100
M19 RD 1101	Research Methodologyand IPR	CC	2	2	0	0	25	75	100
M19 PS 1109	Power System Simulation Laboratory-I	PC	2	0	0	4	25	75	100
M19 PS 1110	Power system Laboratory	PC	2	0	0	4	25	75	100
#AC-1	Audit course -1	AC	0	2	0	0	0	0	0
TOTAL			**18**	**16**	**0**	**8**	**175**	**525**	**700**

#PE-I	M19 PS1103	Electric Power Distribution System
	M19 PS1104	HVDC Transmission
	M19 PS1105	EHVAC Transmission
#PE-II	M19 PS1106	Artificial Intelligence Techniques
	M19 PS1107	Optimization Techniques
	M19 PS1108	Advanced Digital Signal Processing
#AC-1 & 2	M19AC0001	English for Research Paper Writing
	M19AC0002	Disaster Management
	M19AC0003	Sanskrit for Technical Knowledge
	M19AC0004	Value Education
	M19AC0005	Constitution of India
	M19AC0006	Pedagogy Studies
	M19AC0007	Stress Management by Yoga
	M19AC0008	Personality Development through Life Enlightenment Skills.

POWER SYSTEM &AUTOMATION

ADVANCED POWER SYSTEM OPERATION & CONTROL (M19PS1101)

UNIT-I : Generation with limited Energy supply: Take-or-pay fuel supply contract, composite generation production cost function. Solution by gradient search techniques, Base point and participation factor method, hard limits and slack variables, Fuel scheduling by linear programming. Hydroelectric plant models –short term hydrothermal scheduling problem – Gradient approach.

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

UNIT-III: Optimal power flow**:** Solution of OPF, gradient method, Newton's method, linear programming method with only realpower variables, linear programming with AC power flow variables.

UNIT-IV: Single area &Two areas Load Frequency Control: concept of single & two area Load frequency control: uncontrolled case and controlled case, tie-line bias control. Optimal two- area LF control-steady state representation, performance Index and optimal parameter adjustment.

UNIT-V: Interchange Evaluation and Power Pools Economy Interchange, Economy interchange Evaluation, Interchange Evaluation with unit commitment, Multiple Interchange contracts after the fact production costing, Transmission Losses in transaction Evaluation,other types of interchange power pools.

Course Outcomes for First Year First Semester Course	
Course Code: M19PS1101	
Course Title: ADVANCED POWER SYSTEM OPERATION & CONTROL	
CO-1	Understand the effect of generation with limited energy supply.
CO-2	Solve generation dispatching scheme for thermal and hydrounits.
CO-3	Solve the unit commitment problem for economic load dispatch.
CO-4	Get knowledge on load frequency control of single area and two area systems with and without control.
CO-5	Solve the interchange evaluation in interconnected power systems.
CO-6	Solve the optimal power flow problems with different solutions

SYLLABUS: POWER SYSTEM DYNAMICS & STABILITY (M19PS1102)

UNIT-I: Basic Concepts: Power system stability states of operation and system security – system dynamics – system model analysis of steady State stability and transient stability –Modeling of Synchronous Machine: Synchronous machine – park's Transformation of Flux Linkages,
Stator Voltage equation and torque equation-analysis of steady state performance.

UNIT-II: Excitation System: Excitation system modeling-excitation systems block Diagram- Dynamics of a synchronous generator connected to infinite bus – system model Synchronous machine model-stator equations rotor equations – Synchronous machine model with field circuit – one equivalent damper winding on q axis (model 1.1).

UNIT-III: Analysis of Single Machine System: Small signal analysis with block diagram – Computation of Heffron –Phillips constants - Representation Characteristic equation and application of Routh Hurwitz criterion synchronizing and damping torque analysis- Stability by Eigen value Approach.

UNIT-IV: Application of Power System Stabilizers: Basic concepts in applying PSS – Control signals – Structure and tuning of PSS – Washout circuit – Dynamic compensator analysis of singlemachine infinite bus system with and without PSS.

UNIT-V: Digital Simulation of Transient Stability: Swing equation, machine equations – Direct method of solution – Solution Techniques: Modified Euler method – RungeKutta method – Concept of multi machine stability

Course Outcomes for First Year First Semester Course	
Course Code: M19 PS 1102	
Course Title: POWER SYSTEM DYNAMICS & STABILITY	
CO-1	Choose the fundamental dynamic behavior and controls of power systems to perform basic stability analysis.
CO-2	Comprehend concepts in modeling and simulating the dynamic phenomena of power systems
CO-3	Interpret results of system stability studies Analyze theory and practice ofmodeling main power system components, such as synchronous machines, excitation systems and governors.

SYLLABUS: ELECTRIC POWER DISTRIBUTION SYSTEM (M19PS1103)

UNIT-I: Distribution of Power, Management, Power Loads, Load Forecasting Short-term &Long- term,Power System Loading, Technological Forecasting. Advantages of Distribution Management System (D.M.S.) Distribution Automation: Definition, Restoration / Reconfiguration of Distribution Network, Different Methods and Constraints, Power Factor Correction

UNIT-II: Distribution system - reliability analysis – reliability concepts – Markov model – distribution network reliability – reliability performance

UNIT-III: Distribution system expansion - planning – load characteristics – load forecasting – designconcepts – optimal location of substation – design of radial lines – solution technique

UNIT-IV: Calculation of Optimum Number of Switches, Capacitors, Optimum Switching DevicePlacement in Radial, Distribution Systems, Sectionalizing Switches – Types, Benefits,
Bellman's Optimality Principle, Remote Terminal Units, Energy efficiency in electrical distribution &Monitoring

UNIT-V: Maintenance of Automated Distribution Systems, Difficulties in Implementing Distribution. Automation in Actual Practice, Urban/Rural Distribution, Energy Management, AI techniques applied to Distribution Automation

Course Outcomes for First Year First Semester Course	
Course Code: : M19PS1103	
Course Title ELECTRIC POWER DISTRIBUTION SYSTEM	
CO-1	Understanding basic Sanskrit language.
CO-2	Ancient Sanskrit literature about science & technology can be understood.
CO-3	Being a logical language will help to develop logic in students.

SYLLABUS: HVDC TRANSMISSION (M19PS1104)
(ELECTIVE-I)

UNIT-I: Limitation of EHVAC Transmission, Advantages of HVDC Technical economical reliability aspects. HVDC Transmission: General considerations, Power Handling Capabilities of HVDC Lines, Basic Conversion principles, static converter configuration.
Types of HVDC links- Apparatus and its purpose.

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

UNIT-III: Control of HVDC Converters and systems : Constant current, constant extinction angle and constant Ignition angle control. Individual phase control and equidistant firing angle control, DC power flow control. Factors responsible for generation of Harmonics, voltage
and current harmonics, effect of variation of α and μ. Filters for harmonic elimination.

UNIT-IV: Interaction between HVAC and DC systems – Voltage interaction, Harmonic instabilityproblems and DC power modulation. Development of DC circuit Breakers, Multi-terminal
DC links and systems; series, parallel and series-parallel systems, their operation andcontrol.

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

Course Outcomes for First Year First Semester Course	
Course Code: M19PS1104	
Course Title: HVDC TRANSMISSION	
CO-1	Summarize various merits and schemes of HVDC transmission.
CO-2	Understand the basic HVDC transmission equipment and their operation.
CO-3	Apply the control of HVDC systems and to employ filters of given specifications.
CO-4	Demonstrate the interaction between HVAC and HVDC system, and to illustrate the circuit breakers and MTDC systems.
CO-5	Understand the various protection schemes of HVDC transmission.

SYLLABUS: EHVAC TRANSMISSION (M19PS1105)
(ELECTIVE-I)

UNIT-I: Foundation Structures & Design of Centrally Loaded Isolated Footings and Column Pedestals – Introduction, Rigid and Flexible Foundations, Loads and their Effects, Design Requirements, Geotechnical Design, Empirical and Exact Methods of Analysis offoundations, Design Loads for Foundations, Recommended Approach to Structural Design of Foundations. Introduction, General Procedure for Design, Design of Square Footing of Uniform Depth (Pad Footing), Design of sloped Rectangular Footings, Design Procedure, Detailing of Steel, Design of Rectangular Pad Footings, Design of Plain Concrete Footings,
Design of Pedestals, Design Calculation for Pedestals.

UNIT-II: Wall Footings –Introduction Simple Plain Concrete Wall Footings, Reinforced Concrete
Continuous Strip Wall Footings, Design of continuous Strip Wall Footings, Design for Longitudinal Steel, R.C.T Beam Footings in Shrinkable Soils, Foundations of Partition Wall in Ground Floors, Summary.Strip Footings Under Several Columns – Introduction, Design Procedure for Equally loaded and Equally Spaced Columns, Analysis of Continuous Strip Footing for Unsymmetrical Loading, Analysis of Strip Footing with Unsymmetrical Loads, Detailing of Members.

UNIT-III: Raft Foundations –Introduction, Rigid and Flexible Foundations, common Types of Rafts,Deflection Requirements of Beams and Slabs in Rafts, General considerations in Design of Rigid Rafts, Types of Loadings and Choice of Rafts, Record of Contact Pressures Measured Under Rafts, Modern Theoretical Analysis.**Design of Flat Slab Rafts-MatFoundations –** Introduction, Components of Flat Slabs, Preliminary Planning of Flat Slab Rafts, Analysis of Flat Slab by Direct Design Method, Method of Analysis, Values for Longitudinal Distribution and Transverse, Redistribution, Shear in Flat Slabs, Bending of Columns in flat Slabs, Limitations of Direct Design Method for Mats, Detailing of Steel, Design of Edge Beam in Flat Slabs. **Beam and Slab Rafts –** Introduction, Planning of the Raft, Action of the Raft, Approximate Dimensioning of the Raft, Design of the Beam and Slab Raft under Uniform Pressure, Structural Analysis for the Main Slab, Design ofSecondary and Main Beams, Analysis by Winkler Model, Detailing of Steel.

UNIT-IV: Combined Piled Raft Foundations (CPRF) – Introduction, Types and uses of Piled Rafts, ,
Interaction of Pile and Raft, Ultimate Capacity and Settlement of Piles, Estimation of Settlement of Raft in Soils, Allowable Maximum and Differential Settlement in Buildings, Design of CPRF System, conceptual Method of Design, Conceptual Method of Analysis, Distribution of Piles in the Rafts, Theoretical Methods of Analysis.
Circular and Annular Rafts – Introduction, Positioning of chimney Load on Annular Raft, Forces Acting on Annular Rafts, Pressures Under Dead Load and Moment, Methods of Analysis, Conventional Analysis of Annular

Rafts, Analysis of Ring Beams Under circular Layout of Columns, Analysis of Ring Beam Transmitting Column Load to Annular Rafts, Detailing of Annular Raft Under Columns of a Circular Water Tank.

UNIT-V: Under-reamed Pile Foundations – Introduction, Safe Loads on Under-reamed Piles, Design of Under-reamed Pile Foundation for Load Bearing Walls of Buildings, Design of Grade Beams, Design of Under-reamed Piles Under Columns of Buildings, Use of Under-reamed Piles for Expansive Soils.Design of cantilever and Basement Retaining Walls – Introduction, Earth Pressure and Rigid Walls, Calculation of Earth Pressure on Retaining Walls, Design of Rigid Walls, Design of Ordinary R.C. cantilever Walls, Design of cantilever Walls without Toe, Design of Basement Walls, Calculation of Earth Pressures in Clays, Design of Free Standing Basement Walls.

Course Outcomes for First Year First Semester Course	
Course Code: M19PS1105	
Course Title: EHVAC TRANSMISSION	
CO-1	Calculate the transmission line parameters.
CO-2	Calculate the field effects on EHV and UHV AC lines.
CO-3	Determine the corona, RI and audible noise in EHV and UHV lines.
CO-4	Analyze voltage control and compensation problems in EHV and UHV transmission systems.

SYLLABUS: ARITFICIAL INTELLIGENCE TECHNIQUES (M19PS1106)

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

UNIT-II: Fuzzy Logic System:

Introduction to classical sets - properties, operations and relations; Fuzzy sets, membership, Uncertainty, operations, properties, fuzzy relations, cardinalities, membership functions. Fuzzy Logic System Components-Fuzzification, Membership value assignment, development ofrule base and decision making system, defuzzification to crisp sets, defuzzification methods.

UNIT-III: Artificial Neural Networks: Humans and Computers, Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network using error back propagation training, Perceptron convergence theorem, Limitationsand applications of the Perceptron model, Generalized delta learning rule, Hopfield network, Self-organizing network and Recurrent network.

UNIT-IV: Genetic algorithms &Modelling

Introduction-encoding-fitness function-reproduction operators-genetic operators-cross over and mutation-generational cycle-convergence of genetic algorithm.

UNIT-V: Application of AI Techniques-load forecasting-load flow studies-economic load dispatch- load frequency control-reactive power control-speed control of dc and ac motors

Course Outcomes for First Year First Semester Course	
Course Code: M19PS1106	
Course Title: ARITFICIAL INTELLIGENCE TECHNIQUES (ELECTIVE-II)	
CO-1	Analyze and design fuzzy logic systems.
CO-2	Understand the neural networks and analyze the different problems using training algorithms in neural networks.
CO-3	Develop algorithms using genetic algorithm for optimization.
CO-4	Apply AI Techniques in electrical engineering.

SYLLABUS: OPTIMIZATION TECHNIQUES (M19PS1107)

UNIT-I: Introduction to Optimization: Introduction, Historical Development,Engineering applications of Optimization, Statement of Optimization Problem.

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

UNIT-III: Linear Programming: Introduction, Applications of Linear Programming, Standard Form of a Linear Programming, Basic Terminology and Definitions, Exceptional cases, Simplex method, Big-M method,Two-phase method, Revised Simplex method, Duality, De generacy Principle.

UNIT-IV: Non–Linear Programming-I: Unconstrained One Dimensional Minimization Methods- Fibonacci Method, Quadratic Interpolation Method Non- Linear Programming: Unconstrained Optimnization: Univariate Method, Pattern Directions, Powell's Method, Cauchy's Method Or Steepest Descent Method, Powell's Conjugate Direction Method.

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

Course Outcomes for First Year First Semester Course	
Course Code: M19PS1107	
Course Title: OPTIMIZATION TECHNIQUES (ELECTIVE-II)	
CO-1	To learn the essential optimization techniques for the application of engineering problems.
CO-2	To study the optimization techniques for linear and non-linear programming problems.

SYLLABUS: ADVANCED DIGITAL SIGNAL PROCESSING (M19PS1108) (ELECTIVE-II)

UNIT-I: Overview of DSP, Digital filter design and structures: Basic FIR/IIR filter design &structures, design techniques of linear phase FIR filters, IIR filters by impulse invariance, bilinear transformation, FIR/IIR Cascaded lattice structures, and Parallel all pass realization of IIR.

UNIT-II: Multi rate DSP, Decimators and Interpolators, Sampling rate conversion, multistage decimator & interpolator, poly phase filters, QMF, digital filter banks, Applications in subband coding.

UNIT-III: Linear prediction & optimum linear filters, stationary random process, forward-backward linear prediction filters, solution of normal equations, AR Lattice and ARMA Lattice- Ladder Filters, Wiener Filters for Filtering and Prediction.

UNIT-IV: Introduction to multi resolution analysis and wavelets, wavelet properties, The Haar Wavelet, Wavelet decomposition and reconstruction, applications to denoising, KL Transform: Derivation, properties and applications.

UNIT-V: Estimation of Spectra from Finite-Duration Observations of Signals. Nonparametric Methods for Power Spectrum Estimation, Parametric Methods for Power Spectrum Estimation, Minimum Variance Spectral Estimation, Eigenanalysis Algorithms for Spectrum Estimation.

Course Outcomes for First Year First Semester Course	
Course Code: M19PS1108	
Course Title: ADVANCED DIGITAL SIGNAL PROCESSING(ELECTIVE-II)	
CO-1	Understand theory of different filters and algorithms
CO-2	Apply the multirate DSP in subband coding
CO-3	Estimate the optimal parameters of the signals based on the linear equations
CO-4	Apply wavelet and KL transforms for multiresolution analysis
CO-5	Estimate the power spectral parameters of given signals using different methods

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SYLLABUS: RESEARCH METHODOLOGY AND IPR (M19RD1101)
(Common to CST,CS,PSA, IT & CAD)

UNIT-I: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT-II: Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

UNIT-III: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT-IV: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT-V: New Developments in IPR: Administration of Patent System. New developments in IPR;
IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies,IPR and IITs.

Course Outcomes for First Year First Semester Course	
Course Code: M19RD1101	
Course Title: RESEARCH METHODOLOGY AND IPR	
CO-1	Analyze research related information
CO-2	Formulate a Research Proposals and Publish papers with research ethics
CO-3	Award for Intellectual Property Rights like Patents, Trade and Copyrights
CO-4	Analyze Various Intellectual Property Rights
CO-5	Assess New Developments of IPRs in National and International level

SYLLABUS: POWER SYSTEM SIMULATION LABORATORY-I (M19PS1109)

List of Experiments

1. To write MATLAB programs for solving the given electrical networks.
2. To solve the given non-linear equation using Gauss Seidel and Newton-Raphson Techniques.
3. To find the Y-Bus of given power system by Direct Inspection method.
4. Obtain the power flow solution for the given system using Gauss-Seidel method.
5. Obtain the power flow solution for the given system using Newton-Raphson method.
6. Obtain the power flow solution for the given system using Fast Decoupled method.
7. Formation of Z-Bus by building Algorithm.
8. To verify the frequency and power deviations due to step-load changes in a two-area system using SIMULINK.
9. To obtain the swing curve for the given system and determine the stability using SIMULINK model.
10. Obtain the sequence components for the line currents using SIMULINK & MATLAB.
11. To design a state feedback controller for the load frequency control of an isolated power system using pole-placement technique and verify its effects.
12. To verify the effects of PID control on Automatic Voltage Regulator System of the generator by obtaining its terminal voltage step response.
13. To find the optimal dispatch and total cost of generation for three thermal power plants by neglecting transmission losses.

Course Outcomes for First Year First Semester Course	
Course Code: M19PS1109	
Course Title: POWER SYSTEM SIMULATION LABORATORY-I	
CO-1	Verify the theoretical concepts of various aspects of Power System analysis.
CO-2	Demonstrate the ability to identify, formulate and solve Power System engineering problems.
CO-3	Design and conduct experiments, analyze and interpret data.
CO-4	Design a electrical systems or process as per needs and specifications.
CO-5	Use modern engineering tools, software's and equipment to analyze problem.

SYLLABUS: POWER SYSTEM LABORATORY (M19ST1110)

List of Experiments

1. Determination of positive, negative and zero sequence impedances of a 3 – phase transformer
2. Determination of positive, negative and zero sequence reactances of a synchronous machine through symmetrical components method
3. Determination of positive, negative and zero sequence reactances of a synchronous machine through fault analysis
4. Power angle characteristics of a salient pole synchronous machine
5. Determination of dielectric strength of insulating oil
6. Determination of equivalent circuit of a 3-winding transformer
7. Determination of ABCD parameters of transmission lines
8. Characteristics of electro-magnetic type over current relay
9. DMT and IDMT characteristics of a static overvoltage relay
10. DMT and IDMT characteristics of a static undervoltage relay
11. Protection of a transformer with differential relay
12. Characteristics of a negative sequence current relay

Course Outcomes for First Year First Semester Course	
Course Code: M19PS1110	
Course Title: POWER SYSTEM LABORATORY	
CO-1	Evaluate the theoretical concepts of power systems.
CO-2	Demonstrate the modeling of key components of the power systems.
CO-3	Understand the working of power system protection systems.
CO-4	Compare the results of theoretical analyses with the practical ones.
CO-5	Design protection systems of specified requirements.

SYLLABUS: ENGLISH FOR RESEARCH PAPER WRITING (M19AC0001)

UNIT-I: Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT-II: Clarifying Who Did What, Highlighting Your Findings, Hedging And Criticizing Paraphrasing and Plagiarism, Sections of a Paper.

UNIT-III: Abstracts, Introduction, Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-IV: Key skills are needed when writing a Title, key skills are needed when writing an abstract, key skills are needed when writing an introduction, skills needed when writing a Review of the Literature, skills are needed when writing the Methods.

UNIT-V: skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions, useful phrases how to ensure paper is as good as it could possibly be the first-time submission

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0001	
Course Title: ENGLISHFORRESEARCHPAPERWRITING	
CO-1	Understand that how to improve your writing skills and level of readability
CO-2	Learn about what to write in each section
CO-3	UnderstandtheskillsneededwhenwritingaTitleEnsurethegoodqualityof paper at very first time submission

SYLLABUS: DISASTERMANAGEMENT (M19AC0002)

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

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

UNIT-III: Disaster Prone Areas In India: Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

UNIT-IV: Disaster Preparedness And Management Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

UNIT-V: Risk Assessment Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival. Disaster Mitigation Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

Course Outcomes for First Year First Semester Course	
Course Code: : M19AC0002	
Course Title: DISASTER MANAGEMENT	
CO-1	Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO-2	Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO-3	Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO-4	Critically understand the strengths and weaknesses of disaster management approaches, planning & programming in different countries, particularly their home country or the countries they work in.

SYLLABUS: SANSKRIT FOR TECHNICAL KNOWLEDGE (M19AC0003)

UNIT-I: Alphabetsin Sanskrit, Past/Present/Future Tense, Simple Sentences

UNIT-II: Order, Introduction of roots, Technical information about Sanskrit Literature

UNIT-III: TechnicalconceptsofEngineering-Electrical,Mechanical, Architecture, Mathematics

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0003	
Course Title: SANSKRITFORTECHNICALKNOWLEDGE	
CO-1	Understanding basic Sanskrit language.
CO-2	Ancient Sanskrit literature about science& technology can be understood.
CO-3	Being a logical language will help to develop logic in students.

SYLLABUS: VALUEEDUCATION (M19AC0004)

UNIT-I: Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism.Moral and non- moral valuation. Standards and principles. Value judgements.

UNIT-II: Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity, Patriotism, Love for nature ,Discipline

UNIT-III: Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation, Doing best for saving nature

UNIT-IV: Character and Competence –Holy books vs Blind faith.Self-management and Good health. Science of reincarnation. Equality, Nonviolence ,Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0004	
Course Title: VALUE EDUCATION	
CO-1	Knowledge ofself-development
CO-2	Learn the importance of Human values
CO-3	Developing the overall personality

SYLLABUS: CONSTITUTION OF INDIA (M19AC0005)

UNIT-I: History of Making of the Indian Constitution: History , Drafting Committee, (Composition & Working)

UNIT-II: Philosophy of the Indian Constitution: Preamble ,Salient Features

UNIT-III: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies,
Directive Principles of State Policy ,Fundamental Duties

UNIT-IV: Organs of Governance: Parliament, Composition, Qualifications and Disqualifications ,Powers and Functions, Executive, President , Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zilla Panchayat. Elected officials and their roles, CEO Zilla Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments),Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT-V Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0005	
Course Title: CONSTITUTIONOFINDIA	
CO-1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO-2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
CO-3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
CO-4	Discuss the passage of the Hindu Code Bill of 1956.

SYLLABUS: PEDAGOGY STUDIES (M19AC0006)

UNIT-I: Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.

UNIT-II: Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries, Curriculum, Teacher education.

UNIT-III: Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.

UNIT-IV: Theory of change, Strength and nature of the body of evidence for effective pedagogical practices Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies. Professional development: alignment with classroom practices and follow-up support

UNIT-V: Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

SYLLABUS: STRESS MANAGEMENT BY YOGA (M19AC0007)

UNIT-I: Definitions of Eight parts of yoga(Ashtanga)

UNIT-II: Yam and Niyam.
Do's and Don'ts in life.
i) Ahinsa,satya,astheya,brahmacharya and aparigraha
Shaucha, santosh,tapa, wadhyay,ishvarapranidhana

UNIT-III: Asan and Pranayam
i) Various yog poses and their benefits for mind & body ii)Regularization of breathing techniques and its effects-Types pranayama

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0007	
Course Title: STRESSMANAGEMENTBYYOGA	
CO-1	Develop a healthy mind in a healthy body thus improving social health also.
CO-2	Improve efficiency

SYLLABUS: PERSONALITYDEVELOPMENTTHROUGHLIFEENLIGHTENMENTSKILLS (M19AC0008)

UNIT-I: Neetisatakam-Holistic development of personality

Verses-19,20,21,22 (wisdom),Verses-29,31,32(pride&heroism)

Verses-26,28,63,65(virtue),Verses-52,53,59(don'ts),Verses-71,73,75,78(do's)

UNIT-II: Approachtodaytodayworkandduties.ShrimadBhagwadGeeta:Chapter2-Verses:41,47,48

Chapter3-Verses13,21, 27,35,Chapter6-Verses5,13,17,23,35,

Chapter18-Verses45,46,48.

UNIT-III: Statementsofbasicknowledge,ShrimadBhagwadGeeta:Chapter2-Verses56,62,68,

Chapter12-Verses13,14,15,16,17,18,PersonalityofRolemodel.ShrimadBhagwadGeeta: Chapter2-Verses 17,

Chapter 3-Verses 36,37,42, Chapter 4-Verses18,38,39,Chapter18–Verses37,38,63

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0008	
Course Title: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	
CO-1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life.
CO-2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity.
CO-3	Study of Neetishatakam will help in developing versatile personality of students

Regulation: R19	I / IV - B.Tech. II - Semester								
ELECTRICAL AND ELECTRONICS ENGINEERING(POWER SYSTEM & AUTOMATION) **(Under Choice Based Credit System / Elective Course System)**									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2019-20 admitted Batch onwards)									
Course Code	**Course Name**	**Category**	**Cr.**	**L**	**T**	**P**	**Int. Marks**	**Ext. Marks**	**Total Marks**
M19 PS1201	Real Time Control of Power Systems	PC	3	3	0	0	25	75	100
M19 PS 1202	Advanced Power Electronic Converters	PC	3	3	0	0	25	75	100
#PE-III	Program Elective-III	PE	3	3	0	0	25	75	100
#PE-IV	Program Elective-IV	PE	3	3	0	0	25	75	100
M19 PS 1209	Power System Simulation Laboratory-II	PC	2	0	0	4	25	75	100
M19 PS 1210	Power Electronics for Renewable Integration Laboratory	PC	2	0	0	4	25	75	100
M19 PS 1211	Mini Project with Seminar	MP	2	0	0	4	100	--	100
#AC-2	Audit Course-2*	AC	0	2	0	0	0	0	--
TOTAL			**18**	**14**	**0**	**12**	**250**	**450**	**700**

	Code	**Course**
#PE-III	M19 PS1203	Power Quality Issues and Remedies
	M19 PS1204	Digital Protection of Power Systems
	M19 PS1205	Power System Transients
#PE-IV	M19 PS1206	Smart Grids Technologies
	M19 PS1207	Renewable Energy Systems
	M19 PS1208	Advanced Control Theory

POWER SYSTEM & AUTOMATION
SYLLABUS : REAL TIME CONTROL OF POWER SYSTEMS (M19ST1201)

UNIT-I: State Estimation: Different types of State Estimations, Formulation of state Estimation problem, Various criterion's of state estimation, Theory of WLS state estimation, Networkobservability, Pseudo measurements, Bad data observability, Bad data detection,identification and elimination

UNIT-II: Security and Contingency Evaluation : Security concept, Security Analysis and monitoring, Types of contingency, Contingency Analysis of power system network by using AC Power flow and DC power flow methods, Contingency selection, Network sensitivity factors and their calculation, Concentric relaxation, Bounding.

UNIT-III: Computer Control of Power Systems : Need for real time and computer control of power systems, operating states of a power system-state transition diagram, SCADA - functions of Supervisory control and Data Acquisition systems and implementation considerations, Energy Control Centers (ECS/EMS),software requirements for implementing the above functions.

UNIT-IV: Voltage Stability: Voltage collapse, Voltage security, Relation of voltage stability to rotor angle stability. Types of voltage stability, Static Voltage stability analysis, `P-V' curves and `Q-V' curves, Voltage stability static indices, Improvement of voltage stability, Reactivepower optimization.

UNIT-V: PMU: Wide Area Monitoring Systems (WAMS), Placement of Phasor Measurement Units (PMUs), Phasor and Frequency Estimation, Enhanced State Estimation, observability analysis, Voltage Stability assessment and fault detection using Phasor Measurement.

Course Outcomes for First Year Second Semester Course	
Course Code: M19PS1201	
Course Title: REAL TIME CONTROL OF POWER SYSTEMS	
CO-1	Understand Supervisory control and data acquisition and EMS.
CO-2	Analyze the voltage stability of the power system network.
CO-3	Apply knowledge in placement of PMU for power system network
CO-4	Solve the state estimation, and contingency in power system.

SYLLABUS: ADVANCED POWER ELECTRONIC CONVERTERS (M19PS1202)

UNIT-I: Single Phase AC Voltage Controllers-Introduction –Principle of ON-OFF control, Principle of phase angle control, Single phase Bidirectional controllers with Resistive Loads, Single phase controllers with Inductive loads, Three Phase AC Voltage controllers-Analysis of Controllers with star and delta connected resistive, resistive–inductive loads, single phase transformer tap changers -Effects of source and load inductances-numerical problems.

UNIT-II: AC-DC converters- Introduction -Single phase and three phase dual Converters, Power factor improvements: Extinction angle control-symmetrical angle control - single phase sinusoidal PWM-Single phase series converters- Effects of source and load inductances - numerical problems

UNIT-III: Switch-Mode Converter Power Supplies- high-frequency switching- push–pull converter, single-switch forward converter, single-switch fly-back converter, Comparison of Continuous and Discontinuous Conduction Performance, numerical problems.

UNIT-IV: Voltage control of single-phase inverters - sinusoidal PWM –modified PWM – phase displacement Control, PWM Techniques- SHE PWM, Space Vector PWM (SVM), Hysteresis band current control PWM, Advanced modulation techniques-Trapezoidal,staircase, stepped, harmonic injection and delta modulation.

UNIT-V: Multi-level inverters, Types of Multilevel Inverters- Diode-Clamped Multilevel Inverter, Features of Diode-Clamped Inverter, Improved Diode-Clamped Inverter- Flying-Capacitors Multilevel Inverter-Features of Flying-Capacitors Inverter- Cascaded Multilevel Inverter- Principle of Operation- Features of Cascaded Inverter- Comparisons of Multilevel Converters.

Course Outcomes for First Year Second Semester Course	
Course Code: M19PS1202	
Course Title: ADVANCED POWER ELECTRONIC CONVERTERS	
CO-1	Analyze and design of AC-AC Converters for various types of loads.
CO-2	Evaluate the power factor correction methods in AC-DC Converters.
CO-3	Acquire knowledge about analysis and design of SMPS, PWM techniques.
CO-4	Summarize the features of different multilevel inverter.

SYLLABUS: POWER QUALITY ISSUES AND MITIGATION (M19PS1203)

UNIT-I: Introduction

Overview of Power Quality - Concern about the Power Quality - General Classes ofPower Quality Problems – Transients -Long-Duration Voltage Variations - Short-Duration Voltage Variations - Voltage Unbalance - Waveform Distortion - Voltage fluctuation - Power Frequency Variations - Power Quality Terms - Voltage Sags and Interruptions - Sources of Sags and Interruptions – Nonlinear loads.

UNIT-II: Transient Over Voltages

Source of Transient Over Voltages - Principles of Over Voltage Protection - Devices for Over Voltage Protection - Utility Capacitor Switching Transients - Utility Lightning Protection – Load Switching Transient Problems

Long Duration Voltage Variations

Principles of Regulating the Voltage - Device for Voltage Regulation - Utility Voltage Regulator Application - Capacitor for Voltage Regulation - End-user Capacitor Application

UNIT-III: Harmonic Distortion and solutions

Voltage vs. Current Distortion - Harmonics vs. Transients - Power System Quantities under Non-sinusoidal Conditions - Harmonic Indices – Sources of harmonics - Locating Sources of Harmonics – System Response Characteristics - Effects of Harmonic Distortion – Interharmonics- Harmonic Solutions Harmonic Distortion Evaluation - Devices for Controlling Harmonic Distortion - Harmonic Filter Design - Standards on Harmonics

UNIT-IV: Distributed Generation and Power Quality

Resurgence of Distributed Generation - DG Technologies - Interface to the Utility System Power Quality Issues - Operating Conflicts - Wiring and Grounding - Typical Wiring and Grounding Problems -Solution to Wiring and grounding Problems

UNIT-V: Power Quality Enhancement Using Custom Power Devices

Introduction to Custom Power Devices - Static Var Compensation for Distribution Systems

– Static Series Compensator - Static Shunt Compensator(DSTATCOM)-Application ofCustom Power Devices in Power Systems--P-Q theory – Control of P and Q – Dynamic

Voltage Restorer (DVR) – Operation and control – Operation and control – Unified PowerQuality Conditioner (UPQC) – Operation and control.

Course Outcomes for First Year First Semester Course	
Course Code: M19PS1203	
Course Title: POWER QUALITY ISSUES AND MITIGATION	
CO-1	Acquire the knowledge on causes of power quality, power quality parameters.
CO-2	Understand sources of transient over voltages and providing protection to transient over voltages and study devices for voltage regulation
CO-3	Understand effects and sources of harmonics, and design filter for controlling harmonic distortion.
CO-4	Describe power quality aspects in distributed generation and develop solutions to wiring and grounding problems.
CO-5	Analyze the effect of various power quality issues in distribution system and their mitigation principles.

SYLLABUS: DIGITAL PROTECTION OF POWER SYSTEMS (M19PS1204)

UNIT-I: Basic Block diagram – Advantages of Static Relays – Comparators – Phase and amplitude Comparators – General Equations of Comparators – Analysis of Amplitude and Phase Comparators – Operating principles– Static Overcurrent relays – Differential relays – distance relays.

UNIT-II: Pilot relaying and Carrier current protection schemes – Protection of Transmission lines – 3–zone protection schemes – carrier aided distance schemes – switched distance schemes – Transformer protection – mal operation of relays – Harmonic Restraint relay – Wavelet applications in transformer protection – Multi Input Comparator circuits – realization of Elliptical and Quadrilateral characteristics

UNIT-III: Digital Protection: Developments in computer relaying – mathematical basis for protective relaying algorithms, Fourier Transforms – Discrete Fourier transforms – Wavelet transforms – Kalman filtering.

UNIT-IV: Digital protection of transformers – Fourier based algorithms – finite duration impulse response filter based algorithms – least square curve fitting based algorithms – flux restrained current differential relay.

UNIT-V: Digital protection of transmission lines – current based differential schemes – composite voltage and current based schemes – New developments in relaying principles – fundamentals of travelling wave protection – principle of travelling wave distance relay adaptive relaying – fault location algorithms.

Course Outcomes for First Year Second Semester Course	
Course Code: M19PS1204	
Course Title: DIGITAL PROTECTION OF POWER SYSTEMS	
CO-1	Understand the various types of comparators and their realization using static circuits.
CO-2	Understand the realization of over current, distance and differential relays using comparators.
CO-3	Estimate the current and voltage magnitudes from the sampled measurements.
CO-4	Realize the various dynamic characteristics of digital relays for protection of transmission lines, transformers.

SYLLABUS: POWER SYSTEM TRANSIENTS (M19PS1205)

UNIT-I: INTRODUCTION AND SURVEY: Review and importance of the study of transients - causes for transients. RL circuit transientwith sine wave excitation - double frequency transients - basic transforms of the RLCcircuit transients. Different types of power system transients - effect of transients on power systems – role of the study of transients in system planning.

UNIT-II: SWITCHING TRANSIENTS: Over voltages due to switching transients - resistance switching and the equivalent circuit for interrupting the resistor current - load switching and equivalent circuit - waveforms for transient voltage across the load and the switch - normal and abnormal switching transients. Current suppression - current chopping - effective equivalent circuit. Capacitance switching - effect of source regulation - capacitance switching with a restrike, with multiple restrikes. illustration for multiple restriking transients - ferro resonance.

UNIT-III: LIGHTNING TRANSIENTS: Review of the theories in the formation of clouds and charge formation - rate of charging of thunder clouds – mechanism of lightning discharges and characteristics of lightning strokes – model for lightning stroke - factors contributing to good line design - protection using ground wires - tower footing resistance - Interaction between lightning and power system.

UNIT-IV: TRAVELING WAVES ON TRANSMISSION LINE COMPUTATION OF TRANSIENTS: Computation of transients - transient response of systems with series and shunt lumped parameters and distributed lines. Traveling wave concept - step response - Bewely's lattice
diagram - standing waves and natural frequencies - reflection and refraction of travellingwaves.

UNIT-V: TRANSIENTS IN INTEGRATED POWER SYSTEM:
The short line and kilometric fault - distribution of voltages in a power system - Linedropping and load rejection - voltage transients on closing and reclosing lines - over voltage induced by faults -switching surges on integrated system Qualitative application of EMTP for transient computation..

Course Outcomes for First Year Second Semester Course	
Course Code: M19PS1205	
Course Title: POWER SYSTEM TRANSIENTS	
CO-1	Ability to understand and analyze power system operation, stability, control and protection.
CO-2	To limit the effects of lightning over voltages in power systems
CO-3	Understand the concepts of travelling wave theory for transient signals
CO-4	Understand the various transient over voltages and their effects on integrated power system.

SYLLABUS: SMART GRID TECHNOLOGIES (M19PS1206)

UNIT-I: Introduction to Smart Grid: Definition, justification for smart grids, smart grid conceptual model, smart grid architectures, Interoperability, communication technologies, role of smart grids standards, intelligrid initiative, national smart grid mission (NSGM) by Govt. of India

UNIT-II: Smart Transmission Technologies: Substation automation, Supervisory control and data acquisition (SCADA), energy management system (EMS), phasor measurement units (PMU), Wide area measurement systems (WAMS)

UNIT-III: Smart Distribution Technologies: Distribution automation, outage management systems,automated meter reading (AMR), automated metering infrastructure (AMI), fault location isolation and service restoration (FLISR), Outage Management Systems (OMS), EnergyStorage, Renewable Integration.

UNIT-IV: Distributed Generation and Smart Consumption: Distributed energy resources (DERs), smart appliances, low voltage DC (LVDC) distribution in homes / buildings, home energy management system (HEMS), Net Metering, Building to Grid B2G, Vehicle to Grid V2G,
Solar to Grid, Microgrid

UNIT-V: Regulations and Market Models for Smart Grid: Demand Response, Tariff Design, Timeof the day pricing (TOD), Time of use pricing (TOU), Consumer privacy and data protection, consumer engagement etc. Cost benefit analysis of smart grid projects.

Course Outcomes for First Year Second Semester Course	
Course Code: M19PS1206	
Course Title: SMART GRID TECHNOLOGIES	
CO-1	Understand technologies for smart grid
CO-2	Appreciate the smart transmission as well distribution systems
CO-3	Realize the distribution generation and smart consumption
CO-4	Know the regulations and market models for smart grid

SYLLABUS: RENEWABLE ENERGY SYSTEMS (M19PS1207)

UNIT-I: Effects of Conventional Energy methods: Reserves of energy resources – Environmentalaspects of conventional power plants- Impact of energy on economy – Renewable energy scenario in India – Potentials – Achievements.

UNIT-II: Solar Energy: Systems: Solar thermal – Flat plate and concentrating collectors – SolarPhoto Voltaic Conversion System – Working and design of Solar Cells and Panels – PV applications- MPPT methods- New avenues for growth of solar like floating Solar and Solartrees- Power electronic interface with Solar PV systems.

UNIT-III: Wind Energy Systems:Basics of Wind Energy conversion system -Types of wind energysystems – Performance – Energy storage- Applications of Wind energy- Inter connected System – Safety and Environmental Aspects- modern trends in wind turbine technology.

UNIT-IV: Biomass – Cogeneration– Biomass applications - Tidal energy – Wave energy – Mini andMicro hydro – Geothermal energy – Fuel cell systems - Modern trends in Renewable technology.

UNIT-V: Distributed Generation in power systems: Distributed Generation, Voltage effects, Thermal Limits, Impact of Embedded Generation on the power System Power Quality Disturbances, Islanding- Economics of distributed Genration.

Course Outcomes for First Year Second Semester Course	
Course Code: M19PS1207	
Course Title: RENEWABLE ENERGY SYSTEMS	
CO-1	Understand world energy scenario and different Renewable energy systems.
CO-2	Understand the different technologies available in Renewable energy systems.
CO-3	Understand the need for Renewable energy technologies.
CO-4	Get knowledge on New and upcoming renewable energy tehnologies

SYLLABUS: ADVANCED CONTROL THEORY (M19PS1208)

UNIT-I: State Space Analysis & Techniques : The Concept of State and State Models, State Diagram, State Space and State Trajectory, State Space Representation using Phase Variable and Canonical Variables, Solution of State Equation, State Transition Matrix and its Properties, Eigen Values, Eigen Vectors, Model Matrix, Diagolization, GeneralizedEigen vectors, Computation of State Transition Matrix using Laplace Transformation, Power Series Method, Cayley-Hamilton Method, Similarity Transformation Method. Controllability and Observability Tests: Kalman's test, Gilbert's Test, Controllability and Observability Canonical Forms.

UNIT-II: Pole Placement Techniques : Controller Design by State Feedback, Necessary and Sufficient Condition for Arbitrary Pole Placement-State Regulator Problem and State Regulator Design, Evaluation of State Feedback Gain Matrix K, Selection of Location of Desired Closed Loop Poles, State Observer Design, Full Order/Reduced Order Observer Design, Observer Based State Feedback Control, Separation Principle.

UNIT-III: Non-Linear Control System: Introduction, Properties of Nonlinear System, Behavior of Non-Linear System, Classification of Nonlinearities, Common Physical Nonlinearities: Saturation, Friction, Backlash, Dead-Zone, Relay, On-Off Nonlinearity, Nonlinear Spring, Limit cycle, Jump resonance. Phase-Plane Method, Singular points, Stability of Nonlinear System, Construction of Phase Trajectories, Describing Functions Method, Stability Analysis by Describing Function Method. Lyapunov's Stability Analysis, Stability Criterion, Direct Method of Lyapunov and the Linear Systems, Method of Construction of Lyapunov Functions for Nonlinear Systems.

UNIT-IV: Optimal Control:Introduction to Optimal Control, Parameter Optimization: Servomechanism, Optimal Control Problem: Transfer Function and State Variable Approach, State Regulator Problem, Infinite Time Regulator Problem, Output Regulator and the Tracking Problem, Parameter Optimization: Regulators.

UNIT-V: Digital Control Systems: Introduction to Discrete Time Systems, Necessary for Digital Control System, Spectrum Analysis ofSampling Process, Signal Reconstruction, Difference Equations, Z transforms, and the Inverse Ztransform, Pulse Transfer Function, Time Response of Sampled Data Systems, Stability using JuryCriterion, Bilinear Transformation.

Course Outcomes for First Year Second Semester Course	
Course Code: M19PS1208	
Course Title: ADVANCED CONTROL THEORY	
CO-1	Understanding the state variable approach is suitable for higher order.
CO-2	Analyze the concepts of controllability and observability.
CO-3	Analyze the various non-linearities through describing functions and phase plane analysis.
CO-4	Analyze typical issues of stability and instability of continuous time invariant systems.
CO-5	Know how to use the simulation software to design a real time power system .

SYLLABUS: POWER SYSTEM SIMULATION LABORATORY-II (M19PS1209)

LIST OF EXPERIMENTS:

1. ANN based Load Flow Analysis using Back Propagation Algorithm.
2. Economic load dispatch using Neural network.
3. State estimation of power systems using Neural network.
4. Contingency Analysis using Neural Network
5. Genetic Algorithm Program for maximization of sin(x) function using all basic operators.
6. Genetic Algorithm for Economic Load Dispatch of Thermal Units including losses (Use B-coefficients for computation of losses).
7. Simulation and verification of fuzzy Logic experiments using fuzzy logic trainer.
8. Single area and Two area Load Frequency Control using Fuzzy Logic Toolbox.
9. Fuzzy Logic based small signal stability analysis
10. Simulation of HVDC systems

Course Outcomes for First Year Second Semester Course	
Course Code: M19PS1209	
Course Title: POWER SYSTEM SIMULATION LABORATORY-II	
CO-1	Acquire programming skills by utilizing neural networks.
CO-2	Solve the different problems using training algorithms in neural networks.
CO-3	Develop algorithms using genetic algorithm for optimization using MATLAB/SIMULINK software
CO-4	Analyze and design fuzzy logic systems.

SYLLABUS: POWER ELECTRONICS FOR RENEWABLE INTEGRATION LABORATORY (M19PS1210)

LIST OF EXPERIMENTS:

1. Study of 1-ϕ dual converter.
2. Study of 3-ϕ inverter with 120o and 180o mode of operation.
3. Study of 5-level cascaded H-bridge inverter.
4. Determination of input p.f. and harmonic factor for 3-ϕ full converter (Inductive load).
5. Study of 3-level NPC inverter.
6. Experiment on "VI-Characteristics and Efficiency of 1kWp Solar PV System".
7. Experiment on "Shadowing effect & diode based solution in 1kWp Solar PV System".
8. Experiment on Performance assessment of Grid connected and Standalone 1kWp Solar Power System.
9. Experiment on Performance assessment of micro Wind Energy Generator.
10. Experiment on Performance Assessment of Hybrid (Solar-Wind) Power System.
11. Study the characteristics of IGBT, MOSFET & GTO's.
12. Design of gate drive circuits for IGBT & MOSFET's.

Course Outcomes for First Year First Semester Course	
Course Code: M19PS1210	
Course Title: POWER ELECTRONICS FOR RENEWABLE INTEGRATION LABORATORY	
CO-1	Evaluate the theoretical concepts of renewable energy systems
CO-2	Demonstrate the modeling of PWM controled converters
CO-3	Understand the working of IGBT, MOSFET & GTO's. and their gate drive circuits.
CO-4	Compare the Performance of Grid connected and Standalone Solar and wind Power System..

SYLLABUS: MINI PROJECT WITH SEMINAR (M19PS1211)

ForMiniProjectwithSeminar,astudentunderthesupervisionofafacultymember,shallcollectthe literature on a topic and critically review the literature and submit it to the department in a report formand shall make an oral presentation before the Project Review Committee consisting of Head of the Department, supervisor/mentor and two other senior faculty members of the department. For Mini Project with Seminar, there will be only internal evaluation of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

AUDIT COURSE-2(#AC-2)

List of Audit Courses and their Syllabi are mentioned in the First Semester Syllabus.

The students can opt any one course for AC 2 from the list mentioned in first semester by not opting the course which is already taken for AC 1

Regulation: R19	**II / IV - B.Tech. I - Semester**

ELECTRICAL AND ELECTRONICS ENGINEERING
(POWER SYSTEM &AUTOMATION)
(Under Choice Based Credit System / Elective Course System)

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2019-20 admitted Batch onwards)

Course Code	Course Name	Category	Cr.	L	T	P	Int. Marks	Ext. Marks	Total Marks
#PE -V	Program Elective – V	PE	3	3	0	0	25	75	100
#Open Elective	Open Elective	OE	3	3	0	0	25	75	100
M19PS2106	**Dissertation-I / Industrial Project**	PR	10	0	0	20	50	50	100
TOTAL			**16**	**6**	**0**	**20**	**100**	**200**	**300**

	Course Code	Course
#PE-V/ MOOCS	M19PS2101	Power System Automation.
	M19PS2102	Restructured Power System
	M19PS2103	Flexible AC Transmission systems
	M19 PS 2104 (MOOCS-I)	Students Going for Industrial Project / Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a 12 weeks' course duration in PG level with 3 credits, but the chosen subject should not be covered in their M. Tech Course
#OE-I/ MOOCS	#OE-I	Students have to choose one open elective course offered by departments other than the parent department. List of open Electives offered by other departments are enclosed.
	M19 PS 2105 (MOOCS-II)	Students Going for Industrial Project / Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a 12 weeks' course duration in PG level with 3 credits, but the chosen subject should not be covered in their M. Tech Course

OPEN ELECTIVES OFFERED TO OTHER DEPARTMENTS	
M19PS2 107	Electric And Hybrid Vehicles
M19PS2 108	Energy From Waste
M19PS2 109	Energy Management and Auditing

POWER SYSTEM &AUTOMATION
SYLLABUS : POWER SYSTEM AUTOMATION (M19PS2101)
(Programme Elective-V)

UNIT-I : Evolution of Automation systems, History of Power system automation, SupervisoryControl And Data Acquisition(SCADA) Systems, Components of SCADA systems, SCADA Applications, SCADA in power systems, SCADA basic functions, SCADA application functions in Generation, Transmission and Distribution.

UNIT-II : Advantages of SCADA in Power Systems, The Power system 'Field', Types of data&signals in the Power system, Flow of Data from the field to the SCADA Control center. Building blocks of SCADA systems, Classification of SCADA systems.

UNIT-III: Remote Terminal Unit (RTU), Evolution of RTUs, Components of RTU, Communication, Logic, Termination and Test/HMI Subsystems, Power supplies, Advanced RTU Functionalities.

UNIT-IV: Intelligent Electronic Devices (IEDs), Evolution of IEDs , IED functional block diagram,The hardware and software architecture of IED, IED Communication subsystem, IED advanced functionalities, Typical IEDs, Data Concentrators and Merging Units, SCADACommunication Systems.

UNIT-V: Master Station, Master station software and hardware configurations, Server systems in the master station, Small, medium and large master station configurations, Global Positioning Systems, Master station performance, Human Machine Interface (HMI), HMI components, Software functionalities, Situational awareness, Case studies in SCADA.

Course Outcomes for Second Year First Semester Course	
Course Code: M19PS2101	
Course Title: POWER SYSTEM AUTOMATION	
CO-1	Understand the concepts of power system automation.
CO-2	Understand the components of SCADA systems.
CO-3	Comprehend the RTU, IED and other components of automation systems
CO-4	Understand the transfer of signals from the field to an operator control terminal.
CO-5	Design an interoperable powers automation system.

SYLLABUS: RESTRUCTURED POWER SYSTEMS (M19PS2102)
(Programme Elective-V)

UNIT-I: Deregulation, Need and conditions for deregulation, Different Entities in Deregulated Electricity Markets, Problems with Deregulating Electricity, Background to Deregulation and the Current Situation around the World, Benefits from a Competitive Electricity Market, After-Effects of Deregulation.

UNIT-II: Market Structure and Operation, Spot market, forward markets and settlements. Review of Concepts marginal cost of generation. Different structure model like Monopoly model, Purchasing agency model, wholesale competition model, Retail competition model.

UNIT-III: Role of the Independent System Operator (ISO), Operational Planning Activities of ISO, Operational Planning Activities of a Genco, Genco in Pool Markets, Genco in Bilateral Markets, Market Participation Issues, Unit Commitment in Deregulated Environment, Competitive Bidding.

UNIT-IV: Power exchange (PX), Market clearing price (MCP,) Market operations, Market power, Transmission pricing, contract path method, MW-mile method, LMP, Congestion management methods- market splitting, counter-trading, effect of LMP on Congestion..

UNIT-V: Ancillary Services and System Security in Deregulation, Classifications and definitions, Ancillary Services Management in Various Countries, Reactive Power as an Ancillary Service.

Course Outcomes for Second Year First Semester Course	
Course Code: M19PS2102	
Course Title: RESTRUCTURED POWER SYSTEMS	
CO-1	Understand of operation of deregulated electricity market systems.
CO-2	Identify the Typical issues in electricity markets and importance of the Independent System Operator in Deregulation.
CO-3	Analyze various types of electricity market operational and control issues using new mathematical models.
CO-4	Understand the importance of Unit commitment and Ancillary services in Deregulation.

SYLLABUS: FLEXIBLE AC TRANSMISSION SYSTEMS (M19PS2103)
(Programme Elective-V)

UNIT-I: Introduction to FACTS - Concept, power flow and stability, basic theory of line compensation; Thyristor controlled and converter-based FACTS controller - Power Electronic Controllers: Basic types of FACTS controllers, benefits from FACTS Controllers.

UNIT-II: Static Shunt Compensators: Midpoint voltage regulation; Variable impedance type and switching converter type static Var generators, SVC and STATCOM - TCR, TSC, V-I and V-Q characteristics, system stability, Static versus passive VAR compensator,Comparison between SVC and STATCOM.

UNIT-III: Static Series Compensators: Concept of series compensation, voltage stability, variableimpedance type series compensators, GCSC, TSSC, TCSC and SSSC, control techniques, control range and VA rating.

UNIT-IV: SSR and its damping, Unified Power Flow Controller, Circuit Arrangement, Operation and control of UPFC. Basic Principle of P and Q control- Independent real and reactive power flow control- Applications.–Interline Power Flow Controller (IPFC) – Operation and control

UNIT-V: Static Voltage and Phase Angle Regulators: Power flow control, TCVR and TCPAR, improvement of transient stability-Modelling of FACTS devices, optimization of FACTS, transient and dynamic stability enhancement

Course Outcomes for Second Year First Semester Course	
Course Code: M19PS2103	
Course Title: FLEXIBLE AC TRANSMISSION SYSTEMS (Elective-V)	
CO-1	Acquire knowledge about the fundamental principles of Passive and Active Reactive Power Compensation Schemes at Transmission level inPower Systems.
CO-2	Learn various Static VAR Compensation Schemes like Thyristor/GTO Controlled.
CO-3	Explain the need of Reactive Power Systems, PWM Inverter based Reactive Power Systems and their controls.
CO-4	Analyze the effect of Voltage and Phase Angle Regulators on power system stability.

SYLLABUS: MOOCS-I (M19PS2104)

Students Going or Industrial Project/ Thesis will complete these courses through MOOCS. Students can
Also choose SWAYAM or NPTE with a 12 weeks' course duration in PG level with 3 credits, but the chosen subject should not be covered in their M.Tech Course

OPENELECTIVE

Offered from	Course Code	Course Name	Offered to
CIVIL ENGINEERING	M19 ST 2107	Construction Management	CST, CS, PSA,IT & CAD/CAM
	M19 ST 2108	Green Technology	
	M19 ST 2109	Analysis of Offshore Structures	
COMPUTER SCIENCE & ENGINEERING	M19 CST 2106	Python Programming	ST, CS, PSA & CAD/CAM
	M19 CST 2107	Artificial Intelligence	
	M19 CST 2108	Advanced Data structures	
ELECTRONICS & COMMUNICATIONENGINEERING	M19 CS 2107	Signals and systems	ST, CST, PSA, IT & CAD/CAM
	M19 CS 2108	Principles of Communication	
	M19 CS 2109	Image and video Processing	
INFORMATION TECHNOLOGY	M19IT2108	Web Technologies	ST, CS, PSA & CAD/CAM
	M19IT2109	Internet of Things	
	M19IT2110	Machine Learning	
MECHNAICAL ENGINEERING	M19CAD 2107	Operations Research	ST, CST, CS,PSA & IT
	M19CAD 2108	Nano Technology	
	M19CAD 2109	Product Design & Manufacturing	
SCIENCE & HUMANITIES	M19BS2101	Management and OrganisationalBehaviour	ST, CST, CS, PSA, IT & CAD/CAM

SYLLABUS: MOOCS-II (M19PS2105)

Students Going or Industrial Project/ Thesis will complete these courses through MOOCS. Students can
Also choose SWAYAM or NPTE with a 12 weeks' course duration in PG level with 3 credits, but the chosen subject should not be covered in their M.Tech Course

SYLLABUS: DISSERTATION-I/INDUSTRIALPROJECT (M19PS2106)

The Student has to register for Dissertation-I / Industrial project in III semester. Student has to submit,in consultation with his project supervisor, the title, objective and plan of action of his project work for approval. The student can initiate the Project work, only after obtaining the approval from the Project Review Committee(PRC).

Continuous assessment of Dissertation-I during the III- Semester will be monitored by the PRC .Dissertation-I/ IndustrialProjectisevaluatedfor50internalmarksand50 external marks.

Internal marks 50 awarded by Project Guide and PRC jointly based on continuous assessment consisting of two seminars based on Dissertation work-I.

Externalmarks50awardedbyExternalExaminer, Supervisor and Head of the Department jointly based
On a review and Vivavoce on Dissertation work-I.

Regulation: R19							**II / IV - B.Tech. II - Semester**		
ELECTRICAL AND ELECTRONICS ENGINEERING (POWER SYSTEM &AUTOMATION) (Under Choice Based Credit System / Elective Course System)									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2019-20 admitted Batch onwards)									
Course Code	**Course Name**	**Category**	**Cr.**	**L**	**T**	**P**	**Int. Marks**	**Ext. Marks**	**Total Marks**
M19PS2201	Dissertation-II /Industrial Project	PR	16	0	0	32	--	100	100

POWER SYSTEM &AUTOMATION

SYLLABUS : DISSERTATION-II/INDUSTRIALPROJECT (M19PS2201)

The student has to continue his/her work from Dissertation-I / Industrial project to complete Dissertation-II in IV semester.

Continuous assessment of Dissertation-II during IV-Semester will be monitored by the PRC.

Dissertation-II is evaluated for 100 external marks based on Review and Viva Voce.

Review and Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the Thesis. The Board shall jointly report the candidate's work for 100 marks.

If the report of the Viva-Voce is unsatisfactory (ie, < 50 marks), the candidate shall retake the Viva-Voce examination only after three months. If he fails to get a satisfactory report at the second Viva-Voce examination, the candidate has to reregister for the project and complete the project within the stipulated
time after taking the approval from the College.

Regulation: R19	I / II - M.Tech. I - Semester

M.TECH (INFORMATION TECHNOLOGY)
(Under Choice Based Credit System / Elective Course System)

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2019-20 admitted Batch onwards)

Course Code	Course Name	Category	Cr.	L	T	P	Int. Marks	Ext. Marks	Total Marks
M19 IT1101	Discrete Mathematical Structures	PC	3	3	0	0	25	75	100
M19 IT1102	Advanced Data Structures	PC	3	3	0	0	25	75	100
#PE-I	Program Elective-I	PE	3	3	0	0	25	75	100
#PE-II	Program Elective-II	PE	3	3	0	0	25	75	100
M19 RD 1101	Research Methodology andIPR	CC	2	2	0	0	25	75	100
M19 IT1113	Advanced Data Structures Lab	PC	2	0	0	4	25	75	100
M19 IT1114	Computing Lab	PC	2	0	0	4	25	75	100
#AC-1	Audit course -1	AC	0	2	0	0	0	0	0
TOTAL			**18**	**16**	**0**	**8**	**175**	**525**	**700**

	Code	Course		Code	Course
#PE-I	M19IT1103	Artificial Intelligence	#AC 1 & 2	M19AC0001	English for Research Paper Writing
	M19IT1104	Service Oriented Architectures And Web Security		M19AC0002	Disaster Management
	M19IT1105	Internet of Things		M19AC0003	Sanskrit for Technical Knowledge
	M19IT1106	Optimization Techniques		M19AC0004	Value Education
	M19IT1107	Parallel Computer Architecture		M19AC0005	Constitution of India
#PE-II	M19IT1108	Bigdata Analytics		M19AC0006	Pedagogy Studies
	M19IT1109	Principles Of Cryptography		M19AC0007	Stress Management by Yoga
	M19IT1110	Cluster And Grid Computing		M19AC0008	Personality Development throughLife Enlightenment Skills.
	M19IT1111	Imaging and Multimedia Systems			
	M19IT1112	Advanced Graph Theory			

INFORMATION TECHNOLOGY

SYLLABUS : DISCRETE MATHEMATICAL STRUCTURES (M19IT1101)

(Common to CE, CSE, ECE, EEE, IT&ME)

UNIT-I : Review on basic Probability concepts- sample space -Addition and Multiplication theorems- Bay's theorem- Random variables (Discrete & Continuous). Probability mass, density and cumulative distribution functions(for discrete & continuous random variables)-Joint distribution function- discrete & continuous random variables- conditional distribution- Expected value, Variance- Conditional expectation- Central limit theorem, probabilistic inequalities- Chebychev's inequality, Jenson's inequality- Cauchy – Schwartz inequatility- Convergence in probability- Markov chains.

UNIT-II : Parametric families of distributions: Binomial, Poisson, Normal, Uniform, exponential and Gamma distribution, derivation of basic characteristics, Hyper geomentric & multinomial distributions.

UNIT-III: Statistical inference, introduction to multivariate Statistical models: Scatter diagram, fitting of straight line, parabola, power and exponential curves: ax^b , ab^x , ae^{bx} using method of least square approximation, multiple regression (linear equations)- principal component analysis.

Random Samples: Sampling distributions of Estimators, efficient and unbiased estimation, point & interval estimator: Method of moments and maximum likelyhood estimator.

UNIT-IV: Graph Theory: Isomorphism, Planar graphs, Euler's and Hamiltonian circuits or Euler'scycles: graph coloring- Choramotic number.

Trees: Introduction- Trees- Labeled tree- some diagrams on directed and undirected trees,Review of Basic properties of a tree- Sequential representation of a binary tree.

UNIT-V: Counting Methods: Permutation & Combination with & without repetition: Principalinclusion & exclusion: Specials technique to solve combinational enumerator problem.

Recurrence relation: Order & Degree of recurrence relation, Solution of Linear homogeneous and non-homogeneous recurrence relation with constant coefficient using methods of generating function, characteristic roots & particular solution by method of undeterment coefficients.

Course Outcomes for First Year First Semester Course	
Course Code: M19IT1101	
Course Title: DISCRETE MATHEMATICAL STRUCTURES	
CO-1	Utilize basic concepts of discrete and continuous probability theory.
CO-2	Make use of parametric families of distributions in analyzing problems
CO-3	Apply least squares method to fit best suitable curve for a given data
CO-4	Identify population parameters using different methods of estimation
CO-5	Utilize the concepts of graph theory and trees in solving problems.
CO-6	Make use of counting techniques to solve combinational enumerator problem. Also solve recurrence relations by the use of different methods

SYLLABUS: ADVANCED DATA STRUCTURES (M19 IT 1102)

UNIT-I: Dictionaries: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries.
Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing,
Rehashing, Extendible Hashing.

UNIT-II: Skip Lists: Need for Randomizing Data Structures and Algorithms, Search and UpdateOperations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists

UNIT-III: Trees: Binary Search Trees, AVL Trees, Red Black Trees, Trees, B-Trees, Splay Trees

UNIT-IV: Text Processing: Sting Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem
(LCS), Applying Dynamic Programming to the LCS Problem.

UNIT-V: Computational Geometry: One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quad trees, k- D Trees. Recent Trends in Hashing, Trees, and various computational geometry methods for efficiently solving the new evolving problem

Course Outcomes for First Year First Semester Course	
Course Code: M19 IT 1102	
Course Title: ADVANCED DATA STRUCTURES	
CO-1	Analyze programming problem statements.
CO-2	Apply divide and conquer strategy to searching using iterative and/or recursive solutions.
CO-3	Analyze algorithms for text processing applications and develop algorithms for computational geometry problems.
CO-4	Analyze applications using data structure algorithms.

SYLLABUS: ARTIFICIAL INTELLIGENCE (M19 IT 1103)

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

Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative-deepening a*, constraint satisfaction

UNIT-II: Problem reduction and game playing: Introduction, problem reduction, game playing, alpha-beta pruning, two-player perfect information games.

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

UNIT-III: Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.

advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, cyc theory, case grammars, semantic web.

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

UNIT-IV: Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-shafer theory.

Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

UNIT-V: Machine learning paradigms: Introduction, machine learning systems, supervised and unsupervised learnings, inductive learning, deductive learning, clustering, support vector machines, case based reasoning and learning.

Artificial neural networks: Introduction, artificial networks, single layer feed forward networks, multi layered forward networks, design issues of artificial neural networks.

Course Outcomes for First Year First Semester Course	
Course Code: M19 IT 1103	
Course Title: ARTIFICIAL INTELLIGENCE	
CO-1	Able to design & construct knowledge using representation tools & use of problem solving strategies for real time problem solving in terms intelligent agents
CO-2	Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.
CO-3	Able to apply various reasoning techniques to solve the uncertain & incomplete problems using probability theory
CO-4	Able to solve problems by designing the ANN models for classification & prediction

SYLLABUS: SERVICE ORIENTED ARCHITECTURES AND WEB SECURITY (M19 IT 1104)

UNIT-I: XML Technology: XML – XML and Web - Name Spaces – XML Document Structure -Structuring with Schemas and DTD - Modeling Databases in XML – XQuery

UNIT-II: SOA Basics : Service Oriented Architecture (SOA) – Comparing SOA with Client-Server and Distributed architectures - Characteristics of SOA – Benefits of SOA -- Principles of Service orientation – Service layers - Business Process management

UNIT-III: Web Services (WS) : SOA and Web Services – Web Services Protocol Stack – Service descriptions – WSDL – Messaging with SOAP – Service discovery – UDDI. Service-Level Interaction patterns – XML and Web Services - Enterprise Service Bus - .NET and J2EE Interoperability.

UNIT-IV: WS Technologies and Standards : Web Services Technologies - JAX-RPC, JAX-WS. Web Service Standards – WS-RM, WS-Addressing, WS-Policy. Service Orchestration and Choreography – Composition Standards - BPEL. Service Oriented Analysis and Design.

UNIT-V: XML and WS Security :XML Security Overview – Canonicalization – XML Security Framework – XML Encryption – XML Signature – XKMS Structure. Web Services Security - XACML - WS-Security.

Course Outcomes for First Year First Semester Course	
Course Code: M19 IT 1104	
Course Title: SERVICE ORIENTED ARCHITECTURES AND WEB SECURITY	
CO-1	Demonstrate XML Technology and modelling databases in XML
CO-2	Analyze SOA and Web services, some of the prevailing
CO-3	Analyze standards and technologies of Web Services and Security Frame Works

SYLLABUS: INTERNET OF THINGS (M19IT1105)

UNIT-I: FUNDAMENTALS OF IoT: Evolution of Internet of Things, Enabling Technologies, IoT Architectures,oneM2M, IoT World Forum (IoTWF) and Alternative IoT models, Simplified IoT Architecture and Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT-II: IoT PROTOCOLS: IT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks, Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks, Application Transport Methods: Supervisory Control and Data Acquisition, Application Layer Protocols: CoAP and MQTT.

UNIT-III: DESIGN AND DEVELOPMENT: Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks, Arduino, Board details, IDE programming, Raspberry Pi, Interfaces and Raspberry Pi with Python Programming.

UNIT-IV: DATA ANALYTICS AND SUPPORTING SERVICES: Structured Vs Unstructured Data and Data in Motion Vs Data in Rest, Role of Machine Learning – No SQL Databases, Hadoop Ecosystem, Apache Kafka, Apache Spark, Edge Streaming Analytics and Network Analytics, Xively Cloud for IoT, Python Web Application Framework, Django, AWS for IoT, System Management with NETCONF-YANG.

UNIT-V: CASE STUDIES/INDUSTRIAL APPLICATIONS: Cisco IoT system, IBM Watson IoT platform, Manufacturing, Converged Plant wide Ethernet Model (CPwE), Power UtilityIndustry, Grid Blocks Reference Model, Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control.

Course Outcomes for First Year First Semester Course	
Course Code: M19IT1105	
Course Title: INTERNET OF THINGS	
CO-1	Evaluate the concept of 'internet of things' in different contexts.
CO-2	Analyze various protocols for IoT.
CO-3	Design a PoC of an IoT system using Rasperry Pi/Arduino.
CO-4	Apply data analytics and use cloud offerings related to IoT.
CO-5	Analyze applications of IoT in real time scenario.

SYLLABUS: OPTIMIZATION TECHNIQUES (M19 IT 1106)

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

UNIT-II: Formulation of a LPP - Graphical solution revised simplex method - duality theory – dual simplex method - sensitivity analysis - parametric programming.

UNIT-III: Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem – max flow problem - CPM/PERT.

UNIT-IV: Scheduling and sequencing - single server and multiple server models – deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

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

Course Outcomes for First Year First Semester Course	
Course Code: M19 IT 1106	
Course Title: OPTIMIZATION TECHNIQUES	
CO-1	Students should able to **Apply** the dynamic programming to solve problems of discreet and continuous variables.
CO-2	Students should able to **Apply** the concept of non-linear programming
CO-3	Students should able to **Analyze** out sensitivity
CO-4	Student should able to **Analyze** the real world problem and simulate it.

SYLLABUS: PARALLEL COMPUTER ARCHITECTURE (M19 IT 1107)

UNIT-I: Fundamentals of Computer Design: Defining Computer Architecture – Trends in Technology – Trends in Power in Integrated Circuits– Trends in Cost – Dependability – Measuring, Reporting and Summarizing Performance – Quantitative Principles ofComputer Design – Basic and Intermediate concepts of pipelining – Pipeline Hazards – Pipelining Implementation issues.

UNIT-II: Instruction-Level Parallelism and Its Exploitation: Instruction-Level Parallelism: Concepts and Challenges – Basic Compiler Techniques for Exposing ILP – Reducing Branch Costs with Prediction – Overcoming Data Hazards with Dynamic Scheduling – Dynamic Scheduling: Algorithm and Examples – Hardware-Based Speculation – ExploitingILP Using Multiple Issue and Static Scheduling – Exploiting ILP Using Dynamic Scheduling, Multiple Issue and Speculation – Studies of the Limitations of ILP – Limitations on ILP for Realizable Processors – Hardware versus Software Speculation – Using ILP Support to Exploit Thread-Level Parallelism

UNIT-III: Data-Level and Thread-Level Parallelism: Vector Architecture – SIMD Instruction Set Extensions for Multimedia – Graphics Processing Units – Detecting and Enhancing Loop- Level Parallelism – Centralized Shared-Memory Architectures – Performance of Shared- Memory Multiprocessors – Distributed Shared Memory and Directory Based Coherence – Basics of Synchronization – Models of Memory Consistency – Programming Models and Workloads for Warehouse-Scale Computers – Computer Architecture of Warehouse-Scale Computers – Physical Infrastructure and Costs of Warehouse-Scale Computers

UNIT-IV: Memory Hierarchy Design: Cache Performance – Six Basic Cache Optimizations – Virtual Memory – Protection and Examples of Virtual Memory – Ten Advanced Optimizations of Cache Performance – Memory Technology and Optimizations – Protection: Virtual Memory and Virtual Machines – The Design of Memory Hierarchies

UNIT-V: Storage Systems & Case Studies: Advanced Topics in Disk Storage – Definition and Examples of Real Faults and Failures – I/O Performance, Reliability Measures and Benchmarks – Designing and Evaluating an I/O System – The Internet Archive Cluster Case Studies / Lab Exercises: INTEL i3, i5, i7 processor cores, NVIDIA GPUs, AMD, ARM processor cores – Simulators – GEM5, CACTI, SIMICS, Multi2sim and INTEL Software development tools.

Course Outcomes for First Year First Semester Course	
Course Code: M19 IT 1107	
Course Title: PARALLEL COMPUTER ARCHITECTURE	
CO-1	**Assume** representation of data, addressing modes, and instructions sets.
CO-2	**Identify** parallelism both in terms of a single processor and multiple processors
CO-3	**Analyze** parallel hardware constructs to include instruction-level parallelism formulti core processor design

SYLLABUS: BIG DATA ANALYTICS (M19 IT 1108)

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

UNIT-II: Working with Big Data: Google File System, Hadoop Distributed File System (HDFS), Building blocks of Hadoop (Name node, Data node, Secondary Name node, Job Tracker, Task Tracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully
Distributed mode), Configuring XML files.

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

UNIT-IV: Hadoop I/O: The Writable Interface, Writable Comparable and comparators, **Writable Classes:** Writable wrappers for Java primitives, Text, Bytes Writable, Null Writable, Object Writable and Generic Writable, Writable collections, Implementing a Custom Writable: Implementing a Raw
Comparator for speed, Custom comparators

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

Course Outcomes for First Year First Semester Course	
Course Code: M19 IT 1108	
Course Title: BIG DATA ANALYTICS	
CO-1	Identify the programming requirements viz., generic types and methods to perform data analysis
CO-2	Apply the existing technologies in distributed files systems to analyze the bigdata
CO-3	To analyze the Map-Reduce programming model for better optimization
CO-4	Collect, manage, store, query, and analyze big data; and identify the need of interfaces to perform I/O operations in Hadoop

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SYLLABUS: PRINCIPLES OF CRYPTOGRAPHY (M19 IT 1109)

UNIT-I: Algebra: Group, cyclic group, cyclic subgroup, field, probability. Number Theory: Fermat's theorem , Cauchy 's theorem, Chinese remainder theorem, primality testing algorithm, Euclid's algorithm for integers, quadratic residues, Legendre symbol, Jacobisymbol etc.

UNIT-II: Cryptography and cryptanalysis, Classical Cryptography, substitution cipher,different type of attack: CMA,CPA,CCA etc, Shannon perfect secrecy, OTP, Pseudo random bit generators, stream ciphers and RC4.

UNIT-III: Block ciphers: Modes of operation, DES and its variants, AES, linear and differential cryptanalysis.

UNIT-IV: One-way function, trapdoor one-way function, Public key cryptography, RSA cryptosystem, DiffieHellman key exchange algorithm, Elgamal Cryptosystem.

UNIT-V: Cryptographic hash functions, secure hash algorithm, Message authentication, digital signature, RSA digital signature, Elgamal digital signature.

Course Outcomes for First Year First Semester Course	
Course Code: M19 IT 1109	
Course Title: PRINCIPLES OF CRYPTOGRAPHY	
CO-1	**Identify** classical cryptosystems to security problems
CO-2	**Apply** the existing cryptographic algorithms with the existing communication protocols
CO-3	**Analyzing** the application of cryptography for secure eCommerce and other secret transactions

SYLLABUS: CLUSTER AND GRID COMPUTING (M19 IT 1110)

UNIT-I: Introduction: Cluster and Grid computing, Meta-computing, Web services and Grid Computing, e-Governance and the Grid Technologies and Architectures for Grid Computing: Issues in Data Grids, Functional requirements in Grid Computing, Standards for Grid Computing, Recent technology trends in Large Data Grids. Web Services and the Service Oriented Architecture: Service Oriented Architecture, SOAP and WSDL, Creating Web Services, Server Side.

UNIT-II: OGSA and WSRF: OGSA for Resource Distribution, Stateful Web Services in OGSA, WSRF, WSRF Specification, Globus Toolkit: History, version, Applications, Approaches and Benefits, Infrastructure Management, Monitoring and Discovery, Security, Data Choreography and Coordination, GT4 Architecture, GT4 Containers. The Grid and Databases: Requirements, Storage Request Broker, Integration of Databases with the Grid, Architecture of OGSADAI for offering Grid Database services.

UNIT-III: Cluster Computing: Approaches to Parallel Computing, Definition and Architecture of a Cluster, Categories of clusters. Cluster Middleware: Levels and Layers of Single System Image, Design objectives, Resource Management and Scheduling, Cluster programming Environment and Tools. Networking, Protocols & I/O for clusters: Networking and Interconnection/Switching Devices, Design Issues, Design Architecture, HiPPI, ATM, Myrinet, Memory Channel

UNIT-IV: Setting Up and Administering a Cluster: Setup of simple cluster, setting up nodes,clusters of clusters, System monitoring, Global Clocks Sync. Cluster Technology for High Availability: High availability clusters, high availability parallel computing, types of failures and errors, cluster architectures and configurations for high availability, Failure/Recovery clusters.

UNIT-V: Process Scheduling: Job management System, Resource management system, policies of resource utilization, Scheduling policies. Load Sharing and Load Balancing: Introduction, Strategies for load balancing, Modelling parameters. Recent trends: technologies and attributes in Cluster and Grid computing. Case study of various cluster architectures, load balancing and scheduling policies.

Course Outcomes for First Year First Semester Course	
Course Code: M19 IT 1110	
Course Title: CLUSTER AND GRID COMPUTING	
CO-1	Identify the Functionalities & Applications of Grid Computing, Web Services, and Service-oriented architecture.
CO-2	Apply and Analyze Resource management and Scheduling in Grid computing & Cluster Computing.
CO-3	Develop how to setup a cluster, Apply various Process Scheduling Algorithms and load balancing.

SYLLABUS: IMAGING AND MULTIMEDIA SYSTEMS (M19 IT 1111)

UNIT-I: Introduction to Image Processing: Steps in Image Processing Systems –Image Acquisition – Sampling and Quantization – Pixel Relationships – Colour Fundamentals and Models. Introduction to Multimedia: Multimedia Elements – Multimedia applications – Multimedia System Architecture – Evolving technologies for Multimedia – Defining objects for Multimedia systems – Multimedia Data interface standards – Multimedia Databases.

UNIT-II: Compression and Decompression: Need for Data Compression – Types of Compression – Binary Image Compression Schemes – Image Compression – Video Compression – Audio Compression. Data and File Format Standards: Rich Text Format – TIFF File Format – Resource Interface File Format – MIDI File Format - JPEG DIB File Format – AVI Indeo File Format – MPEG Standards

UNIT-III: Image computing: The basics of processing 2D images- Thresholding -Convolution-Edge detection-Mathematical Morphology and Shape Descriptors-Noise Reduction- Image Fusion. Image Security: Image Forensics - Steganography -Image Cryptography Techniques-Chaos based and Non-Chaos based methods.

UNIT-IV: Input and Output Technologies: Multimedia I/O Technologies: Image Scanners – DigitalVoice and Audio – Digital Camera – Video Images and Animation – Full Motion Video -
Video Motion Analysis.

UNIT-V: Multimedia Application Classes – Types of Multimedia Systems – Virtual Reality – Components of Multimedia Systems -Multimedia Authoring Systems – Multimedia Authoring Tools - User Interface Design-Mobile Messaging – Hypermedia Message Components -Hypermedia Linking and embedding.

Course Outcomes for First Year First Semester Course	
Course Code: M19 IT 1111	
Course Title: IMAGING AND MULTIMEDIA SYSTEMS	
CO-1	Able to design the models for new compression standards
CO-2	Acquire skill set to handle all multimedia components & able to save the images in various formats
CO-3	Able to develop Integrated and Collaborative multimedia systems
CO-4	Able to apply various information security methods like stenography
CO-5	Able to design an effective user interface using HTML & XML

SYLLABUS: ADVANCED GRAPH THEORY (M19 IT 1112)

UNIT-I: Basic Concepts- Graphs and digraphs, incidence and adjacency matrices, isomorphism, the automorphism group, **Trees-** Equivalent definitions of trees and forests, Cayley's formula, the Matrix-Tree theorem

UNIT-II: Connectivity- Cut vertices, cut edges, bonds, the cycle space and the bond space, blocks, Menger's theorem, **Paths and Cycles-** Euler tours, Hamilton paths and cycles, theorems of Dirac, Ore, Bondy and Chvatal, circumference, the Chinese Postman Problem, the Travelling Salesman problem, diameter and maximum degree.

UNIT-III: Matchings- Berge's Theorem, perfect matchings, Hall's theorem, Tutte's theorem, Konig's theorem, Petersen's theorem, algorithms for matching and weighted matching (in both bipartitie and general graphs), factors of graphs (decompositions of the complete graph), Tutte's f- factor theorem, **Extremal problems-** Independent sets and covering numbers

UNIT-IV: Colorings- Brooks theorem, the greedy algorithm, the Welsh-Powell bound, critical graphs,chromatic polynomials, girth and chromatic number, Vizing's theorem, **Graphs on surfaces-** Planar graphs, duality, Euler's formula, Kuratowski's theorem, toroidal graphs, 2-cell embeddings, graphs on other surfaces.

UNIT-V: Directed graphs- Tournaments, directed paths and cycles, connectivity and strongly connected digraphs, Networks and flows- Flow cuts, max flow min cut theorem, Selectedtopics- Dominating sets, the reconstruction problem.

Course Outcomes for First Year First Semester Course	
Course Code: M19 IT 1112	
Course Title: ADVANCED GRAPH THEORY	
CO-1	**Evaluate** precise and accurate mathematical definitions of objects in graphtheory.
CO-2	**Analyze** and solve some real time problems using concepts of graph theory(e.g., scheduling problems).
CO-3	**Develop** some classical graph algorithms in order to find sub graphs withdesirable properties.

SYLLABUS: RESEARCH METHODOLOGY AND IPR (M19RD1101)

UNIT-I: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT-II: Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format ofresearch proposal, a presentation and assessment by a review committee

UNIT-III: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents,Patenting under PCT.

UNIT-IV: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT-V: New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Course Outcomes for First Year First Semester Course	
Course Code: M19RD1101	
Course Title: RESEARCH METHODOLOGY AND IPR	
CO-1	Analyze research related information
CO-2	Formulate a Research Proposals and Publish papers with research ethics
CO-3	Award for Intellectual Property Rights like Patents, Trade and Copyrights
CO-4	Analyze Various Intellectual Property Rights
CO-5	AssessNew Developments of IPRs in National and International level

SYLLABUS: ADVANCED DATA STRUCTURES LAB (MTIT1113)

1. Perform various operations on AVL Trees
2. Perform various operations on BST
3. Implementation of Static Hashing
4. Implementation of Huffman coding
5. Implementation of B Tree.
6. Consider telephone book database of N clients. Make use of a hash table implementation to quickly look up client's telephone number.
7. Implement all the functions of a dictionary (ADT) using hashing. Data: Set of (key, value)pairs, Keys are mapped to values, Keys must be comparable, Keys must be unique Standard Operations: Insert(key, value), Find(key), Delete(key)
8. For given set of elements create skip list. Find the element in the set that is closest to some given value.
9. Implement KMP algorithm for Pattern Matching
10. Implement Boyer-Moore algorithm for Pattern Matching
11. Implement Naïve string matching algorithm.
12. Implement insertion, deletion, display and search operation in m-way B tree (i.e. a nonleafnode can have atmost m children) for the given data as integers (Test the program form=3, 5, 7).
13. Implementation of Skiplists

Course Outcomes for First Year First Semester Course	
Course Code: MTIT1113	
Course Title: ADVANCED DATA STRUCTURES LAB	
CO-1	Be capable to **Develop** solutions for a range of problems using object oriented programming.
CO-2	Be capable to **Identity** the appropriate data structure for given problem
CO-3	Be capable to **Analyze** performance of algorithms.

SYLLABUS: COMPUTING LAB (M19IT1114)

1. Write a python program to print the multiplication table forthe given number.
2. Write a python program to check whether the given number is prime or not.
3. Write a python program to find factorial of the given number.
4. Write a python program to implement simple Chatbot.
5. Write a python program to implement List operations (Nested List, Length, Concatenation,Membership, Iteration, Indexing and Slicing).
6. Write a python program to implement List methods (Add, Append, Extend & Delete).
7. Write a python program to Illustrate Different Set Operations.
8. Write a python program to generate Calendar for the given month and year.
9. Write a python program to implement Simple Calculator program.
10. Write a python program to Add Two Matrices.
11. Write a python program to Transpose a Matrix.
12. Write a python program to remove punctuations from the given string?
13. Implementation Write a python program to sort the sentence in alphabetical order.
14. Write a python program to implement Breadth First Search Traversal.
15. Write a python program to implement Water Jug Problem.
16. Write a program to implement Hangman game using python.
17. Write a program to implement Tic-Tac-Toe game using python.
18. Write a python program to remove stop words for a given passage from a text file using NLTK.
19. Write a python program to implement stemming for a given sentence using NLTK.
20. Write a python program to POS (Parts of Speech) tagging for the give sentence using NLTK?

Course Outcomes for First Year First Semester Course	
Course Code: M19IT1114	
Course Title: COMPUTING LAB	
CO-1	Design real life situational problems and think creatively about solutions of them.
CO-2	Formulate a solution clearly and accurately in a program using Python.
CO-3	Inspect the best features of Python to program real life problems using AI.

SYLLABUS: ENGLISH FOR RESEARCH PAPER WRITING (M19AC0001)

UNIT-I: Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity andVagueness.

UNIT-II: Clarifying Who Did What, Highlighting Your Findings, Hedging And Criticizing, Paraphrasing and Plagiarism, Sections of a Paper.

UNIT-III: Abstracts, Introduction, Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.

UNIT-IV: Key skills are needed when writing a Title, key skills are needed when writing an abstract,key skills are needed when writing an introduction, skills needed when writing a Review of the Literature, skills are needed when writing the Methods.

UNIT-V: skills needed when writing the Results, skills are needed when writing the Discussion, skillsare needed when writing the Conclusions, useful phrases, how to ensure paper is as good as it could possibly be the first-time submission

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0001	
Course Title: ENGLISH FOR RESEARCH PAPER WRITING	
CO-1	Understand that how to improve your writing skills and level of readability
CO-2	Learn about what to write in each section
CO-3	Understand the skills needed when writing a Title Ensure the good quality of paper at very first time submission

SYLLABUS: DISASTER MANAGEMENT (M19AC0002)

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

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

UNIT-III: Disaster Prone Areas In India:

Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics.

UNIT-IV: Disaster Preparedness And Management

Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation OfRisk: Application Of Remote Sensing, Data From Meteorological And Other Agencies,

Media Reports: Governmental And Community Preparedness.

UNIT-V: Risk Assessment

Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

Disaster Mitigation

Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

SYLLABUS: SANSKRIT FOR TECHNICAL KNOWLEDGE (M19AC0003)

UNIT-I: Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

UNIT-II: Order, Introduction of roots, Technical information about Sanskrit Literature

UNIT-III: Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0003	
Course Title: SANSKRIT FOR TECHNICAL KNOWLEDGE	
CO-1	Understanding basic Sanskrit language.
CO-2	Ancient Sanskrit literature about science & technology can be understood.
CO-3	Being a logical language will help to develop logic in students.

SYLLABUS: VALUE EDUCATION (M19AC0004)

UNIT-I: Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism.Moral and non- moral valuation. Standards and principles. Value judgements.

UNIT-II: Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, NationalUnity, Patriotism, Love for nature ,Discipline

UNIT-III: Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free fromanger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits.Association and Cooperation, Doing best for saving nature

UNIT-IV: Character and Competence –Holy books vs Blind faith.Self-management and Good health.Science of reincarnation. Equality, Nonviolence ,Humility, Role of Women.
All religions and same message. Mind your Mind, Self-control. Honesty, Studyingeffectively.

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0004	
Course Title: VALUE EDUCATION	
CO-1	Knowledge of self-development
CO-2	Learn the importance of Human values
CO-3	Developing the overall personality

SYLLABUS: CONSTITUTION OF INDIA (M19AC0005)

UNIT-I: History of Making of the Indian Constitution: History , Drafting Committee, (Composition & Working)

UNIT-II: Philosophy of the Indian Constitution: Preamble ,Salient Features

UNIT-III: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties

UNIT-IV: Organs of Governance:
Parliament, Composition, Qualifications and Disqualifications ,Powers and Functions, Executive, President , Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions
Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zilla Panchayat. Elected officials and their roles, CEO Zilla Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments),Village
level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT-V: Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0005	
Course Title: CONSTITUTION OF INDIA	
CO-1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO-2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
CO-3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure ofthe proposal of direct elections through adult suffrage in the Indian Constitution.
CO-4	Discuss the passage of the Hindu Code Bill of 1956.

SYLLABUS: PEDAGOGY STUDIES (M19AC0006)

UNIT-I: Introduction and Methodology:
Aims and rationale, Policy background, Conceptual framework and terminology Theoriesof learning, Curriculum, Teacher education. Conceptual framework, Research questions.
Overview of methodology and Searching.

UNIT-II: Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries, Curriculum, Teacher education.

UNIT-III: Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effectivepedagogy.

UNIT-IV: Theory of change, Strength and nature of the body of evidence for effective pedagogical practices Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies. Professional development: alignment with classroom practices and follow-up support

UNIT-V: Research gaps and future directions: Research design, Contexts,Pedagogy,Teacher education,Curriculum and assessment,Dissemination and research impact.

SYLLABUS: STRESS MANAGEMENT BY YOGA (M19AC0007)

UNIT-I: Definitions of Eight parts of yoga (Ashtanga)

UNIT-II: Yam and Niyam.

Do's and Don'ts in life.

i) Ahinsa, satya, astheya, brahmacharya and aparigraha

ii) Shaucha, santosh, tapa, swadhyay, ishvarapranidhana

UNIT-III: Asan and Pranayam

i) Various yog poses and their benefits for mind & body

ii)Regularization of breathing techniques and its effects-Typespranayama

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0007	
Course Title: STRESS MANAGEMENT BY YOGA	
CO-1	Develop a healthy mind in a healthy body thus improving social health also.
CO-2	Improve efficiency

SYLLABUS: PERSONALITY DEVELOPMENT THROUGH LIFEENLIGHTENMENT SKILLS (M19AC0008)

UNIT-I: Neetisatakam-Holistic development of personality

Verses- 19,20,21,22 (wisdom), Verses- 29,31,32 (pride & heroism)

Verses- 26,28,63,65 (virtue),Verses- 52,53,59 (don'ts),Verses- 71,73,75,78 (do's)

UNIT-II: Approach to day to day work and duties. ShrimadBhagwadGeeta : Chapter 2-Verses: 41,47,48 Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
Chapter 18-Verses 45, 46, 48.

UNIT-III: Statements of basic knowledge, ShrimadBhagwadGeeta: Chapter2-Verses 56, 62, 68, Chapter 12 -Verses 13, 14, 15, 16,17, 18, Personality of Role model. ShrimadBhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39, Chapter18 – Verses 37,38,63

Course Outcomes for First Year First Semester Course	
Course Code: M19AC0008	
Course Title: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	
CO-1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life.
CO-2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity.
CO-3	Study of Neetishatakam will help in developing versatile personality of students.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)
(Affiliated to JNTUK, Kakinada),(Recognized by AICTE, NewDelhi) Accredited by NAAC with'A'Grade
UG Programmes CE, CSE, ECE, EEE, IT & ME are Accredited by NBA
ChinnaAmiram, Bhimavaram-534204. (AP)
Estd:1980

Regulation: R19	**I / II - M.Tech. II - Semester**

M.TECH (INFORMATION TECHNOLOGY)
(Under Choice Based Credit System / Elective Course System)

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2019-20 admitted Batch onwards)

Course Code	Course Name	Category	Cr.	L	T	P	Int. Marks	Ext. Marks	Total Marks
M19IT1201	Advanced Algorithms	PC	3	3	0	0	25	75	100
M19IT1202	Full Stack Technologies	PC	3	3	0	0	25	75	100
#PE-III	Program Elective-III	PE	3	3	0	0	25	75	100
#PE-IV	Program Elective-IV	PE	3	3	0	0	25	75	100
M19IT1213	Advance AlgorithmsLab	PC	2	0	0	4	25	75	100
M19IT1214	Full Stack Technologies Lab	PC	2	0	0	4	25	75	100
M19IT1215	Mini Project withSeminar	MP	2	0	0	4	100	--	100
#AC-2	Audit course -2*	AC	0	2	0	0	0	0	0
TOTAL			**18**	**14**	**0**	**12**	**250**	**450**	**700**

	Code	**Course**
#PE-III	M19IT1203	Machine Learning
	M19IT1204	DevOps
	M19IT1205	Advanced Network Principles and Protocols
	M19IT1206	Distributed Computing
	M19IT1207	Social Network Analytics
#PE-IV	M19IT1208	Digital Image Processing
	M19IT1209	Block Chain Technologies
	M19IT1210	Data Science
	M19IT1211	Soft Computing
	M19IT1212	Natural Language Processing

INFORMATION TECHNOLOGY
SYLLABUS : ADVANCED ALGORITHMS (M19IT1201)
(Common to CE, CSE, ECE, EEE, IT&ME)

UNIT-I :Sorting: Review of various sorting algorithms, topological sorting **Graph:** Definitions and **Elementary Algorithms:** Shortest path by BFS, shortest path in edge-weighted case (Dijkasra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis.

UNIT-II : Matroids: Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST. Greedy Algorithms: Theoretical foundations for greedymethods, A Task scheduling problem.

UNIT-III: Flow-Networks: Max flow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm. **Matrix Computations:** Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix.

UNIT-IV: Shortest Path in Graphs: Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming. **Modulo Representation of integers/polynomials:** Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Application: Interpolation problem. Polynomials and the FFT:Representation of of polynomials, The DFT and FFT, Efficient FFT Implementation

UNIT-V: Linear Programming: Geometry of the feasibility region and Simplex algorithm **Completeness:** Examples, proof of NP-hardness and NP-completeness. One or more of the following topics based on time and interest Approximation algorithms, Randomized Algorithms, Interior Point Method.

Course Outcomes for First Year First Semester Course	
Course Code: M19IT1201	
Course Title: ADVANCED ALGORITHMS	
CO-1	Analyze advanced algorithms and solve practical problem using them.
CO-2	Categorize the different problems in various classes according to their complexity.
CO-3	Design and build solutions for a real world problem by applying relevant distributions

SYLLABUS : FULL STACK TECHNOLOGIES (M19IT1202)
(Common to CE, CSE, ECE, EEE, IT&ME)

UNIT-I : HTML : Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols - The World Wide Web-HTTP request message-response message-Web Clients Web Servers. Markup Languages: XHTML an Introduction to HTML, History, Versions, Basic, XHTML Syntax and Semantics Some Fundamental HTML Elements-Relative URLs-Lists-tables- Frames-Forms-HTML 5.0.

UNIT-II : Cascading Style Sheets (CSS) : Style Sheets: CSS-Introduction to Cascading Style Sheets- Features-Core Syntax-Style Sheets and HTML- Style Rule Cascading and Inheritance-Text Properties-Box Model Normal Flow Box Layout beyond the Normal Flow-CSS3.0, Boot strap basics, Boot strap CSS3, Introduction to Java Script, Jscript basics, JScripts objects, JSON, Don.

UNIT-III: Jscript : Separating Programming and Presentation: JSP Technology, Introduction to JSP andServlets-Running JSP Applications, Basic JSP-JavaBeans Classes and JSP-Tag Libraries andFiles-Support for the Model-View-Controller Paradigm- Mongo DB, JQuery, Mean stack Fundamentals.

UNIT-IV: Angular Js : Introducing AngularJS, Starting Out with AngularJS, Basic AngularJS, Directives and Controllers, AngularJS Modules, Creating First Controller, working with and Displaying, Arrays, more Directives, working with ng-repeat, Unit Testing in AngularJS, Forms, Inputs, and Services, Working with ng-model, Working with Forms, Leverage Data-Binding and Models, Form Validation and States, Error Handling with Forms, ngModelOptions, Nested Forms with ng-form, Other Form Controls.

UNIT-V: PHP Programming: Back – end- Scripts PHP, Working with PHP- Using variables, Using constants, Data types, Operators. Conditional & Control statements, Arrays, functions. Working with forms and Databases such as MySQL.

Course Outcomes for First Year First Semester Course	
Course Code: M19IT1202	
Course Title: FULL STACK TECHNOLOGIES	
CO-1	Identify the Basic Concepts of Web & Markup Languages
CO-2	Develop web Applications using Scripting Languages & Frameworks
CO-3	Creating & Running Applications using JSP libraries
CO-4	Creating Our First Controller Working with and Displaying in Angular Js and Nested Forms with ng-form
CO-5	Creating & Running Back-end scripts & Connecting to Databases

SYLLABUS : MACHINE LEARNING (M19IT1203)
(Common to CE, CSE, ECE, EEE, IT&ME)

UNIT-I : Introduction-Towards Intelligent Machines, Well posed Problems, Example of Applications in diverse fields, Data Representation, Domain Knowledge for Productive use of Machine Learning, Diversity of Data: Structured / Unstructured, Forms of Learning, Machine Learning and Data Mining, Basic Linear Algebra in Machine Learning Techniques.

UNIT-II : Supervised Learning- Rationale and Basics: Learning from Observations, Bias and Why Learning Works: Computational Learning Theory, Occam's Razor Principle and Over fitting Avoidance Heuristic Search in inductive Learning, Estimating Generalization Errors, Metrics for assessing regression, Metris for assessing classification.

UNIT-III: Statistical Learning- Machine Learning and Inferential Statistical Analysis, Descriptive Statistics in learning techniques, Bayesian Reasoning: A probabilistic approach to inference, K-Nearest Neighbor Classifier. Discriminant functions and regression functions, Linear Regression with Least Square Error Criterion, Logistic Regression for Classification Tasks, Fisher's Linear Discriminant and Thresholding for Classification, Minimum Description Length Principle.

UNIT-IV: Support Vector Machines (SVM)- Introduction, Linear Discriminant Functions for Binary Classification, Perceptron Algorithm, Large Margin Classifier for linearly seperable data, Linear Soft Margin Classifier for Overlapping Classes, Kernel Induced Feature Spaces, Nonlinear Classifier, Regression by Support vector Machines. Learning with Neural Networks: Towards Cognitive Machine, Neuron Models, Network Architectures, Perceptrons, Linear neuron and the Widrow-Hoff Learning Rule, The error correction delta rule.

UNIT-V: Multilayer Perceptron Networks and error back propagation algorithm, Radial Basis Functions Networks. Decision Tree Learning: Introduction, Example of classification decision tree, measuresof impurity for evaluating splits in decision trees, ID3, C4.5, and CART decision trees, pruning thetree, strengths and weakness of decision tree approach.

Course Outcomes for First Year First Semester Course	
Course Code: M19IT1203	
Course Title: MACHINE LEARNING	
CO-1	Domain Knowledge for Productive use of Machine Learning and Diversityof Data.
CO-2	Demonstrate on Supervised and Computational Learning
CO-3	Analyze on Statistics in learning techniques and Logistic Regression
CO-4	Illustrate on Support Vector Machines and Perceptron Algorithm
CO-5	Design a Multilayer Perceptron Networks and classification of decision tree

SYLLABUS : DEVOPS (M19IT1204)
(Common to CE, CSE, ECE, EEE, IT&ME)

UNIT-I : Phases of Software Development life cycle. Values and principles of agile software development.

UNIT-II : Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system.

UNIT-III: DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

UNIT-IV: CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment, Benefits of CI/CD, Metrics to track CICD practices

UNIT-V: Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity model, DevOps maturity Assessment

Course Outcomes for First Year First Semester Course	
Course Code: M19IT1204	
Course Title: DEVOPS	
CO-1	Apply the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility
CO-2	Identity DevOps & DevSecOps methodologies and their key concepts
CO-3	List out the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
CO-4	Set up complete private infrastructure using version control systems and CI/CD tools

SYLLABUS : ADVANCED NETWORK PRINCIPLES AND PROTOCOLS (M19IT1205)

(Common to CE, CSE, ECE, EEE, IT&ME)

UNIT-I : Introduction to Networks - Application of Networks - Architecture Topology Switching -SLIP, PPP -ALOHA protocols, CSMA/CD, IEEE 802.3, 802.4, 802.5

UNIT-II : Network Layer Issues- Routing, Congestion control- Internetworking - Issues, Address Learning Bridges, Spanning tree, Source routing, Bridges, Routers, Gateway.

UNIT-III: Network Protocol- IP datagram - hop by hop routing, ARP, RARP, DHCP -Sub net Addressing, Address Masking, ICMP, RIP, RIPV2, OSPF, DNS, LAN and WAN Multicast.

UNIT-IV: Transport Layer- Design issues, Connection Management, Transmission Control Protocol(TCP) - User Datagram Protocol (UDP).

UNIT-V: Transport Layer- Design issues, Connection Management, Transmission Control Protocol(TCP) - User Datagram Protocol (UDP).

Course Outcomes for First Year First Semester Course	
Course Code: M19IT1205	
Course Title: ADVANCED NETWORK PRINCIPLES AND PROTOCOLS	
CO-1	Identify the different layers of TCP/IP protocol stack
CO-2	Analyze the Concepts of Network media and topologies, Network security concepts and Network management
CO-3	Identify the working principle of different protocols at different layers

SYLLABUS : DISTRIBUTED COMPUTING (M19IT1206)
(Common to CE, CSE, ECE, EEE, IT&ME)

UNIT-I : INTRODUCTION: Definition, Relation to computer system components, Motivation, Relation to parallel systems, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions, Design issues and challenges. A model of distributed computations: A distributed program, A model of distributed executions, Models of communication networks, Global state, Cuts, Past and future cones of an event, Models of process communications. Logical Time: A framework for a system of logical clocks, Scalar time, Vector time, Physical clock synchronization: NTP.

UNIT-II : MESSAGE ORDERING & SNAPSHOTS: Message ordering and group communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order. Global state and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels

UNIT-III: DISTRIBUTED MUTEX & DEADLOCK: Distributed mutual exclusion algorithms: Introduction, Preliminaries, Lamport's algorithm, RicartAgrawala algorithm, Maekawa's algorithm, Suzuki–Kasami's broadcast algorithm. Deadlock detection in distributed systems: Introduction, System model, Preliminaries, Models of deadlocks, Knapp's classification, Algorithms for the single resource model, the AND model and the OR model.

UNIT-IV: RECOVERY & CONSENSUS: Check pointing and rollback recovery: Introduction, Background and definitions, Issues in failure recovery, Checkpoint-based recovery, Log- based rollback recovery, coordinated check pointing algorithm, Algorithm for asynchronous check pointing and recovery. Consensus and agreement algorithms: Problem definition, Overview of results, Agreement in a failure –free system, Agreement in synchronous systems with failures.

UNIT-V: P2P & DISTRIBUTED SHARED MEMORY: Peer-to-peer computing and overlay graphs: Introduction, Data indexing and overlays, Chord – Content addressable networks, Tapestry. Distributed shared memory: Abstraction and advantages, Memory consistency models, Shared memory Mutual Exclusion.

Course Outcomes for First Year First Semester Course	
Course Code: M19IT1206	
Course Title: DISTRIBUTED COMPUTING	
CO-1	Elucidate the foundations and issues of distributed systems
CO-2	Analyze various synchronization issues and global state for distributedsystems.
CO-3	Analyze the Mutual Exclusion and Deadlock detection algorithms in distributed systems
CO-4	Analyze the agreement protocols and fault tolerance mechanisms in distributed systems.
CO-5	Analyze the features of peer-to-peer and distributed shared memory systems

SYLLABUS : SOCIAL NETWORK ANALYTICS (M19IT1207)
(Common to CE, CSE, ECE, EEE, IT&ME)

UNIT-I: INTRODUCTION: Social Network Analysis: Preliminaries and definitions, Erdos Number Project, Centrality measures, Balance and Homophily.

UNIT-II: Random graph models: Random graphs and alternative models, Models of network growth, Navigation in social Networks, Cohesive subgroups, Multidimensional Scaling, Structural equivalence, roles and positions.

UNIT-III: Network topology and diffusion, Contagion in Networks, Complex contagion, Percolation and information, Navigation in Networks Revisited.

UNIT-IV: Small world experiments, small world models, origins of small world, Heavy tails, Small Diameter, Clustering of connectivity, The ErdosRenyi Model, Clustering Models.

UNIT-V: Network structure -Important vertices and page rank algorithm, towards rational dynamics in networks, basics of game theory, Coloring and consensus, biased voting, network formation games, network structure and equilibrium, behavioral experiments, Spatial and agent-based models.

Course Outcomes for First Year First Semester Course	
Course Code: M19IT1207	
Course Title: SOCIAL NETWORK ANALYTICS	
CO-1	Identify social network analysis and measures
CO-2	Analyze random graph models and navigate social networks data
CO-3	Apply the network topology and Visualization tools.
CO-4	Analyze the experiment with small world models and clustering models.
CO-5	Compare the application driven virtual communities from social network Structure.

SYLLABUS : DIGITAL IMAGE PROCESSING (M19IT1208)
(Common to CE, CSE, ECE, EEE, IT&ME)

UNIT-I: Introduction: Fundamental steps in Image Processing System, Components of Image Processing System, Elements of Visual Perception, Image Sensing and acquisition, Image sampling & Quantization, Basic Relationship between pixels. **Image Enhancement Techniques**: Spatial Domain Methods: Basic grey level transformation, Histogram equalization, Image subtraction, image averaging.

UNIT-II: Spatial filtering: Smoothing, sharpening filters, Laplacian filters, Frequency domain filters,Smoothing and sharpening filters, Homomorphism is filtering. **Image Restoration & Reconstruction**: Model of Image Degradation/restoration process, Noise models, Spatial filtering, Inverse filtering, Minimum mean square Error filtering, constrained least square filtering, Geometric mean filter, Image reconstruction from projections. Color Fundamentals, Color Models, Color Transformations.

UNIT-III: Image Compression: Redundancies- Coding, Interpixel, Psycho visual; Fidelity, Source and Channel Encoding, Elements of Information Theory; Loss Less and Lossy Compression; Run length coding, Differential encoding, DCT, Vector quantization, Entropy coding, LZW coding; Image Compression Standards-JPEG, JPEG 2000, MPEG; Video compression.

UNIT-IV: Wavelet Based Image Compression: Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete WaveletTransform (DWT), Continuous, Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding.

UNIT-V: Image Segmentation: Discontinuities, Edge Linking and boundary detection, Thresholding, Region Based Segmentation, Watersheds; Introduction to morphological operations; binary morphology- erosion, dilation, opening and closing operations, applications; basic gray-scale morphology operations; Feature extraction; Classification; Object recognition. **Digital Image Watermarking**: Introduction, need of Digital Image Watermarking, applications of watermarking in copyright protection and Image quality analysis.

Course Outcomes for First Year First Semester Course	
Course Code: M19IT1208	
Course Title: DIGITAL IMAGE PROCESSING	
CO-1	Identify the components of image processing
CO-2	Classify various filtration techniques.
CO-3	Apply image compression techniques.
CO-4	Simplify the concepts of wavelet transforms
CO-5	Analyze the concept of morphological image processing.

SYLLABUS : BLOCK CHAIN TECHNOLOGIES (M19IT1209)

(Common to CE, CSE, ECE, EEE, IT&ME)

UNIT-I: The consensus problem ,Asynchronous Byzantine Agreement ,AAP protocol and its analysis ,Nakamoto Consensus on permission-less, nameless, peer-to-peer network - Abstract Models for BLOCKCHAIN - GARAY model ,RLA Model - Proof of Work (PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS).

UNIT-II: Cryptographic basics for cryptocurrency - a short overview of Hashing, signature schemes, encryption schemes and elliptic curve cryptography.

UNIT-III: Bitcoin, Wallet, Blocks, Merkley Tree, hardness of mining, transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bitcoin.

UNIT-IV: Ethereum - Ethereum Virtual Machine (EVM), Wallets for Ethereum - Solidity, Smart Contracts, some attacks on smart contracts.

UNIT-V: (Trends and Topics) - Zero Knowledge proofs and protocols in Blockchain, Succinct non interactive argument for Knowledge (SNARK), pairing on Elliptic curves, Zcash.

Course Outcomes for First Year First Semester Course	
Course Code: M19IT1209	
Course Title: BLOCK CHAIN TECHNOLOGIES	
CO-1	Analyse the foundation of the Block chain technology and understand the processes in payment and funding.
CO-2	Identify the risks involved in building Block chain applications
CO-3	Analyse the legal implications using smart contracts.
CO-4	Choose the present landscape of Blockchain implementations and Understand Crypto currency markets
CO-5	Examine how to profit from trading crypto currencies.

SYLLABUS : DATA SCIENCE (M19IT1210)
(Common to CE, CSE, ECE, EEE, IT&ME)

UNIT-I: Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.

UNIT-II: Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources

UNIT-III: Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

UNIT-IV: Data visualization-Introduction, Types of data visualization, Data for Visualization- Datatypes, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.

UNIT-V: Applications of Data Science, Technologies for visualization, Bokeh (Python), Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.

Course Outcomes for First Year First Semester Course	
Course Code: M19IT1210	
Course Title: DATA SCIENCE	
CO-1	Analyse how data is collected, managed and stored for data science.
CO-2	Identify the key concepts in data science, including their real-world applications and the toolkit used by data scientists.
CO-3	Apply data collection and management scripts using MongoDB.

SYLLABUS : SOFT COMPUTING (M19IT1211)
(Common to CE, CSE, ECE, EEE, IT&ME)

UNIT-I: Introduction to Neuro – Fuzzy and Soft Computing, Fuzzy Sets, Basic Definition and Terminology, Set-theoretic Operations, Member Function Formulation and Parameterization, Fuzzy Rules and Fuzzy Reasoning, Extension Principle and Fuzzy Relations, Fuzzy If-Then Rules, Fuzzy Reasoning, Fuzzy Inference Systems, Mamdani Fuzzy Models, Surgeon Fuzzy Models, Tsukamoto Fuzzy Models, Input Space Partitioning and Fuzzy Modeling.

UNIT-II: Derivative based Optimization, Descent Methods, The Method of Steepest Descent, Classical Newton's Method, Step Size Determination, Derivative-free Optimization, Genetic Algorithms, Simulated Annealing and Random Search – Downhill Simplex Search.

UNIT-III: Introduction, Knowledge Representation, Reasoning, Issues and Acquisition: Prepositional and Predicate Calculus Rule Based knowledge Representation Symbolic Reasoning under Uncertainty Basic knowledge Representation Issues Knowledge acquisition, Heuristic Search: Techniques for Heuristic search Heuristic Classification State Space Search: Strategies Implementation of Graph Search based on Recursion Patent directed Search Production System and Learning.

UNIT-IV: Adaptive Neuro-Fuzzy Inference Systems, Architecture – Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

UNIT-V: Printed Character Recognition, Inverse Kinematics Problems, Automobile Fuel Efficiency Prediction, Soft Computing for Color Recipe Prediction.

Course Outcomes for First Year First Semester Course	
Course Code: M19IT1211	
Course Title: SOFT COMPUTING	
CO-1	Classify the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
CO-2	Simplify the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic
CO-3	Identify fundamental theory and concepts of neural networks, Identify differentneural network architectures, algorithms, applications and their limitations
CO-4	Identify appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications
CO-5	Analyze different applications of these models to solve engineering and other problems..

SYLLABUS : NATURAL LANGUAGE PROCESSING (M19IT1212)
(Common to CE, CSE, ECE, EEE, IT&ME)

UNIT-I: Introduction: NLP tasks in syntax, semantics, and pragmatics. Applications such as information extraction, question answering, and machine translation. The problem of ambiguity. The role of machine learning. Brief history of the field.

UNIT-II: N-gram Language Models: The role of language models, Simple Ngram models. Estimatingparameters and smoothing. Evaluating language models. Part of Speech Tagging and Sequence Labeling: Lexical syntax. Hidden Markov Models. Maximum Entropy Models.Conditional Random Fields.

UNIT-III: Syntactic parsing: Grammar formalisms and tree banks. Efficient parsing for context-free grammars (CFGs).Statistical parsing and probabilistic CFGs (PCFGs). Lexicalized PCFGs.

UNIT-IV: Semantic Analysis: Lexical semantics and word-sense disambiguation. Compositional semantics. SemanticRole Labeling and Semantic Parsing.

UNIT-V: Information Extraction (IE) and Machine Translation (MT): Named entity recognition and relation extraction. IE using sequence labeling. Basic issues in MT. Statistical translation, word alignment, phrase based translation, and synchronous grammars. Dialogues: Turns and utterances, grounding, dialogue acts and structures Natural Language Generation: Introduction to language generation, architecture, discourse planning (text schemata, rhetorical relations).

Course Outcomes for First Year First Semester Course	
Course Code: M19IT1212	
Course Title: NATURAL LANGUAGE PROCESSING	
CO-1	Identify approaches to syntax and semantics in NLP
CO-2	Classify approaches to discourse, generation, dialogue and summarization within NLP.
CO-3	Identify current methods for statistical approaches to machine translation.
CO-4	Identify machine learning techniques used in NLP, including hidden Markov models and probabilistic
CO-5	Distinguish context-free grammars, clustering and unsupervised methods, log-linear and discriminative models, and the EM algorithm as applied within NLP

SYLLABUS : ADVANCE ALGORITHMS LAB (M19IT1213)
(Common to CE, CSE, ECE, EEE, IT&ME)

1. Write a program to implement topological sorting.
2. Write a program to implement Quick Sort of given elements
3. Write a program to Implement DFS for a Graph.
4. Write a program to implement BFS for a Graph
5. Write a program Implement Krushkal's algorithm to generate a min-cost spanning tree
6. Write a program Implement Prim's algorithm to generate a min-cost spanning tree.
7. Write a program to implement dijkstra's greedy algorithm for single source shortest path problem
8. Write a program to implement Ford-Fulkerson algorithm for computing a maximum flow in a Network.
9. Write a program to implement Dynamic Programming algorithm for the chained matrix Multiplication.
10. Write a program to implement Floyd's dynamic programming algorithm for the all pair shortest path Problem.
11. Write a program to implement Approximate algorithm for Vertex-Cover Problem.
12. Write a program to implement Approximate algorithm solve Travelling Salesperson Problem.

Course Outcomes for First Year First Semester Course	
Course Code: M19IT1213	
Course Title: ADVANCE ALGORITHMS LAB	
CO-1	Identify different classes of problems concerning their computation difficulties
CO-2	Analyze the performance of the Advanced Algorithm
CO-3	Apply advanced algorithm techniques to solve real world problems.

SYLLABUS : FULL STACK TECHNOLOGIES LAB (M19IT1214)
(Common to CE, CSE, ECE, EEE, IT&ME)

1. Implementation of 'get' and 'post' methods.
2. CSS implementation in colors, boarder padding.
3. CSS3 implementation button frames tables, navigation bars.
4. Create registration and login forms with validations using Jscript query.
5. Jscript to retrieve student information from student database using database connectivity.
6. Angular Js data binding
7. Angular JS directives and Events
8. Using angular Js fetching data from MySQL.
9. Write a PHP program for registering users of a website and login.
10. User Authentication:

    Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a PHP for doing the following.

    Write a program to create a Cookie and add these four user id's and passwords to this Cookie.

    b. Read the user id and passwords entered in the Login form (exp1) and authenticate with the values (user id and passwords) available in the cookies.

    If he is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display "You are not an authenticated user ''. Use init-parameters to do this.
11. Install a database (Mysql or Oracle):

    Create a table which should contain at least the following fields: name, password, email-id, phone number (these should hold the data from the registration form).

    a) Write a PHP program to connect to that database and extract data from the tables and display them.
    b) Experiment with various SQL queries.
    c) Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.
12. Write a PHP program which does the following job:

    Insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the user name and password from the database (Similar to week8 instead of cookies).

Course Outcomes for First Year First Semester Course	
Course Code: M19IT1214	
Course Title: FULL STACK TECHNOLOGIES LAB	
CO-1	Identify the Basic Concepts of Web & Markup Languages
CO-2	Develop web Applications using Scripting Languages & Frameworks
CO-3	Creating & Running Applications using JSP libraries
CO-4	Creating Our First Controller Working with and Displaying in Angular Js andNested Forms with ng-form
CO-5	Creating & Running Back-end scripts & Connecting to Databases

SYLLABUS : MINI PROJECT WITH SEMINAR (M19IT1215)

For Mini Project with Seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Project Review Committee consisting of Head of the Department, supervisor/mentor and two other senior faculty members of the department. For Mini Project with Seminar, there will be only internal evaluation of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

SYLLABUS : AUDIT COURSE-2 (#AC-2)

List of Audit Courses and their Syllabi are mentioned in the First Semester Syllabus.

The students can opt any one course for AC 2 from the list mentioned in first semester by not opting the course which is already taken for AC 1

Regulation: R19									**II/ II - M.Tech. I - Semester**
M.TECH (INFORMATION TECHNOLOGY) **(Under Choice Based Credit System / Elective Course System)**									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2019-20 admitted Batch onwards)									
Course Code	**Course Name**	**Category**	**Cr.**	**L**	**T**	**P**	**Int. Marks**	**Ext. Marks**	**Total Marks**
#PE-V/ MOOCS	Program Elective-V	PE	3	3	--	--	25	75	100
#OE-I/ MOOCS	Open Elective-I	OE	3	3	--	--	25	75	100
M19IT2107	**Dissertation-I /Industrial Project#**	PR	10	--	--	20	50	50	100
TOTAL			**16**	**6**	**--**	**20**	**100**	**200**	**300**

	Code	Course
#PE-V/ MOOCS	M19IT2101	Deep Learning
	M19IT2102	Embedded Computing
	M19IT2103	Ethical Hacking
	M19IT2104	Digital Marketing
	M19IT2105 (MOOCS-I)	Students Going for Industrial Project / Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a 12 weeks' course duration in PG level with 3 credits, but the chosen subject should not be covered in their M. Tech Course
#OE-I/ MOOCS	#OE-I	Students have to choose one open elective course offered by departmentsother than the IT & CSE departments. List of open Electives offered by other departments are enclosed.
	M19IT2106 (MOOCS-II)	Students Going for Industrial Project / Thesis will complete these coursesthrough MOOCS. Students can also choose SWAYAM or NPTEL with a 12 weeks' course duration in PG level with 3 credits, but the chosensubject should not be covered in their M. Tech Course

OPEN ELECTIVES OFFERED TO OTHER DEPARTMENTS

Code	Course
M19IT2108	Web Technologies
M19IT2109	Internet of Things
M19IT2110	Machine Learning

INFORMATION TECHNOLOGY
SYLLABUS : DEEP LEARNING (M19IT2101)

UNIT-I : Introduction: Various paradigms of learning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques. **Feed forward neural network:** Artificial Neural Network, activation function, multi-layer neural network

UNIT-II : Training Neural Network: Risk minimization, loss function, back propagation, regularization, model selection, and optimization. **Deep Neural Networks:** Difficulty of training deep neural networks, Greedy layer wise training.

UNIT-III: Deep Learning: Deep Feed Forward network, regularizations, training deep models, dropouts, Convolution Neural Network, Recurrent Neural Network, and Deep Belief Network.

UNIT-IV: Probabilistic Neural Network: Hopfield Net, Boltzmann machine, RBMs, Sigmoid net, Auto encoders.

UNIT-V: Applications: Object recognition, sparse coding, computer vision, natural language processing. **Introduction to Deep Learning Tools:** Tensor Flow, Caffe, Theano, Torch.

Course Outcomes for Second Year First Semester Course	
Course Code: M19IT2101	
Course Title: DEEP LEARNING	
CO-1	Demonstrate the basic concepts fundamental learning techniques and layers.
CO-2	Discuss the Neural Network training, various random models.
CO-3	Explain different types of deep learning network models.
CO-4	Classify the Probabilistic Neural Networks.
CO-5	Implement tools on Deep Learning techniques.

SYLLABUS: EMBEDDED COMPUTING (M19IT2102)
(LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS)
(Common to All Branches)

UNIT-I: Linux and Embedded Systems: An Introduction- What is an Embedded System?, Embedded system components, Basic software, Operating systems for embedded systems, Why Linux- based embedded systems?, Linux evolution, **Linux-based Embedded System Component Stack-** Linux-based embedded system components, Reference hardware model, Reference hardware model implementations, CPU memory map, The role of the bootloader, Possible scenarios, An example of bootloader operations.

UNIT-II: Linux kernel, Device tree, System programs, Application, Typical layout of the root filesystem, **Anatomy of a Linux-based System -** Linux architecture, Conceptual view of the kernel, Process scheduler, Memory manager, Memory manager external interfaces, Memory manager architecture, Virtual file system, i-node, i-node interface, File interface, Virtual file system architecture, Inter-process communication, Inter-process communication architecture

UNIT-III: Introduction to Linux kernel modules- Introduction, CPU – I/O interface, CPU – I/O interface with polling, CPU – I/O interface with interrupt, CPU – I/O interface, CPU – I/O interface latency, Direct memory access (DMA) architecture, DMA transfer modes, I/O taxonomy, Typical operations, Linux devices, The Virtual File System (VFS) abstraction, VFS– an example, VFS functions– include/linux/fs.h, The device file concept, Linux kernel modules – the initialization function, the cdev data structure, the initialization function, the clean-up function, custom VFS functions

UNIT-IV: File Handling: Memory Mapping- Page Alignment, Establishing Memory Mappings, Unmapping Regions, Syncing Memory Regions to Disk, Locking Memory Regions, File Locking, Lock Files, Record Locking, Mandatory Locks, Leasing a File.

UNIT-V: Networking with Sockets: Protocol Support, Nice Networking, Real Networking, Making Reality Play Nice, Addresses, Utility Functions, Basic Socket Operations, Creating a Socket, Establishing Connections, Binding an Address to a Socket, Waiting for Connections, Connecting to a Server, Finding Connection Addresses, Networking Machines with TCP/IP, Byte Ordering, IPv4 Addressing, IPv6 Addressing, Manipulating IP Addresses, Turning Names into Addresses, Turning Addresses into Names, Listening for TCP Connection, TCP Client Applications

Course Outcomes for Second Year First Semester Course	
Course Code: M19IT2102	
Course Title: EMBEDDED COMPUTING	
CO-1	Knowledge and understanding of Embedded Linux OS Architecture, LinuxKernel Modules
CO-2	Describes the differences between the general computing system and the embedded computing system.
CO-3	Write client server program using TCP sockets

SYLLABUS: ETHICAL HACKING (M19IT2103)

UNIT-I: Hacking Windows: BIOS Passwords, Windows Login Passwords, Changing Windows Visuals, Cleaning Your Tracks, Internet Explorer Users, Cookies, URL Address Bar, Netscape Communicator, Cookies URL History, The Registry, Baby Sitter Programs.

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UNIT-II: Advanced Windows Hacking: Editing your Operating Systems by editing Explorer.exe, TheRegistry, The Registry Editor, Description of .reg file, Command Line Registry Arguments, Other System Files, Some Windows & DOS Tricks, Customize DOS, Clearing the CMOS without opening your PC, The Untold Windows Tips and Tricks Manual,Exiting Windows the Cool and Quick Way, Ban Shutdowns: A Trick to Play, Disabling Display of Drives in My Computer, Take Over the Screen Saver, Pop a Banner each time Windows Boots, Change the Default Locations, Secure your Desktop Icons and Settings.

UNIT-III: Getting Past the Password: Passwords: An Introduction, Password Cracking, Cracking theWindows Login Password, The Glide Code, Windows Screen Saver Password, XOR, Internet Connection Password, Sam Attacks, Cracking Unix Password Files, HTTP Basic Authentication, BIOS Passwords, Cracking Other Passwords.

UNIT-IV: The Perl Manual: Perl: The Basics, Scalars, Interacting with User by getting Input, Chomp() and Chop(), Operators, Binary Arithmetic Operators, The Exponentiation Operator(**), The Unary Arithmetic Operators, Other General Operators, Conditional Statements, Assignment Operators. The : Operator, Loops, The While Loop, The For Loop, Arrays, THE FOR EACH LOOP: Moving through an Array, Functions Associated with Arrays, Push() and Pop(), Unshift() and Shift(), Splice(), Default Variables, $_, @ARGV, Input Output, Opening Files for Reading, Another Special Variables.

UNIT-V: Virus Working, Boot Sector Viruses (MBR or Master Boot Record), File or Program Viruses, Multipartite Viruses, Stealth Viruses, Polymorphic Viruses, Macro Viruses, Blocking Direct Disk Access, Recognizing Master Boot Record (MBR) Modifications, Identifying Unknown Device Drivers, making own Virus, Macro Viruses, Using Assembly to Create your own Virus, Modifying a Virus so Scan won't Catch it, Creating New Virus Strains, Simple Encryption Methods.

Course Outcomes for Second Year First Semester Course	
Course Code: M19IT2103	
Course Title: ETHICAL HACKING	
CO-1	Remember various hacking methods, system security vulnerability testing.
CO-2	Apply system vulnerability attacks and demonstrate a security assessment report
CO-3	Understand various issues related to hacking

SYLLABUS: DIGITAL MARKETING (M19IT2104)

UNIT-I: HTML: Introduction, HTML5, Audio Elements, Video Elements, Organizing Elements. **Scripting Documents:** Dynamic Document content, Document properties, Legacy DOM, Document Collections, Overview of the W3C DOM, Traversing a Document, Finding Elements in a Document, Modifying a Document, Adding Content to a Document Example

UNIT-II: Cascading Style Sheets and Dynamic HTML: Overview of CSS, CSS for DHTML Scripting inline Styles, Scripting computed styles, Scripting CSS Classes, Scripting Style Sheets, Java Script and XML: Obtaining XML Documents, Manipulating XML with the DOM API, Transforming XML with XSLT querying XML with X path, Serializing XML, Example, XML and Web services.

UNIT-III: Search Engine Optimization (SEO): Searching Engine Marketing, Search Engine Optimization, Measuring SEO Success, Mapping with SEO Journey, **Search Advertising:** Online Advertising Payment Models, Search Advertising (Desktop & Mobile Devices), Planning & Executing a search Advertising Camping, Strategic Implications of Advertising on the search Network.

UNIT-IV: Search Media Marketing: What is Social Media? Social Media Marketing, Social Media Marketing Strategy, Adopting Social Media in Organizations: Internal Learning, Paid-Owned-Earned Media, Social CRM, **Mobile Marketing:** Mobile Internet in India, What is Mobile Marketing? Email Marketing Strategy, Forms of Mobile Marketing, Mobile Advertising, M-Commerce.

UNIT-V: E-Mail Marketing: E-Mail Marketing in India, What is E-Mail Marketing? E-Mail Marketing Strategy, Executing E-Mail Marketing, **Internet Marketing:** Internet Marketing Strategy, Content Marketing, Content Marketing in India.

Course Outcomes for Second Year First Semester Course	
Course Code: M19IT2104	
Course Title: DIGITAL MARKETING	
CO-1	Explain about web pages with basic HTML5, DHTML tags using CSS and XML, the overview of W3C DOM.
CO-2	Student can apply digital Java Scripts to applications
CO-3	Apply search engine optimization techniques to a website.
CO-4	Illustrate how the effectiveness of a digital marketing campaign can be measured
CO-5	Apply advanced practical skills in common digital marketing tools such as SEO,SEM, Social media and Blogs

SYLLABUS: MOOCS-I (Program Elective-V) (M19IT2105)

Students Going for Industrial Project / Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a 12 weeks' course duration in PG level with 3 credits, but the chosen subject should not be covered in their M. Tech Course

Offered from	Course Code	Course Name	Offered to
CIVIL ENGINEERING	M19 ST 2107	Construction Management	**CST, CS, PSA,IT & CAD/CAM**
	M19 ST 2108	Green Technology	
	M19 ST 2109	Analysis of Offshore Structures	
ELECTRONICS & COMMUNICATION ENGINEERING	M19 CS 2107	Signals and systems	**ST, CST, PSA, IT & CAD/CAM**
	M19 CS 2108	Principles of Communication	
	M19 CS 2109	Image and video Processing	
ELECTRICAL & ELECTRONICS ENGINEERING	M19PS2107	Electric And Hybrid Vehicles	**ST, CST, CS, IT & CAD/CAM**
	M19PS2108	Energy From Waste	
	M19PS2109	Energy Management and Auditing	
MECHNAICAL ENGINEERING	M19CAD 2107	Operations Research	**ST, CST, CS,PSA & IT**
	M19CAD 2108	Nano Technology	
	M19CAD 2109	Product Design & Manufacturing	
SCIENCE & HUMANITIES	M19BS2101	Management and Organisational Behaviour	**ST, CST, CS,PSA, IT & CAD/CAM**

SYLLABUS: MOOCS-II (M19IT2106)

Students Going for Industrial Project / Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a 12 weeks' course duration in PG level with 3 credits, but the chosen subject should not be covered in their M. Tech Course

SYLLABUS: DISSERTATION-I/INDUSTRIAL PROJECT (M19IT2107)

The Student has to register for Dissertation-I / Industrial project in III semester. Student has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work for approval. The student can initiate the Project work, only after obtaining the approval from the Project Review Committee (PRC).

Continuous assessment of Dissertation-I during the III-Semester will be monitored by the PRC. Dissertation-I/ Industrial Project is evaluated for 50 internal marks and 50 external marks.

Internal marks 50 awarded by Project Guide and PRC jointly based on continuous assessment consisting of two seminars based on Dissertation work-I.

External marks 50 awarded by External Examiner, Supervisor and Head of the Department jointly based on a review and Viva voce on Dissertation work-I.

Regulation: R19							II / II - M.Tech. I I I - Semester		
M.TECH (INFORMATION TECHNOLOGY) **(Under Choice Based Credit System / Elective Course System)**									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2019-20 admitted Batch onwards)									
Course Code	**Course Name**	**Category**	**Cr.**	**L**	**T**	**P**	**Int. Marks**	**Ext. Marks**	**Total Marks**
M19IT2201	**Dissertation-II /Industrial Project#**	PR	16	0	0	32	--	100	100

SYLLABUS: DISSERTATION-II/INDUSTRIAL PROJECT (M19IT2201)

The student has to continue his/her work from Dissertation-I / Industrial project to complete Dissertation-II in IV semester.

Continuous assessment of Dissertation-II during IV-Semester will be monitored by the PRC.

Dissertation-II is evaluated for 100 external marks based on Review and Viva Voce.

Review and Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the Thesis. The Board shall jointly report the candidate's work for 100 marks.

If the report of the Viva-Voce is unsatisfactory (ie, < 50 marks), the candidate shall retake the Viva-Voce examination only after three months. If he fails to get a satisfactory report at the second Viva-Voce examination, the candidate has to reregister for the project and complete the project within the stipulated
time after taking the approval from the College.

Regulation: R19	**I / II - M.Tech. I - Semester**

MECHANICAL ENGINEERING (CAD/CAM)
(Under Choice Based Credit System / Elective Course System)

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2019-20 admitted Batch onwards)

Course Code	Course Name	Category	Cr.	L	T	P	Int. Marks	Ext. Marks	Total Marks
M19CAD 1101	Geometric Modeling	PC	3	3	0	0	25	75	100
M19CAD 1102	Computer Aided Manufacturing	PC	3	3	0	0	25	75	100
#PE-I	Program Elective-I	PE	3	3	0	0	25	75	100
#PE-II	Program Elective-II	PE	3	3	0	0	25	75	100
M19CAD 1109	Advanced CAD Lab	PC	2	0	0	4	25	75	100
M19CAD 1110	Advanced Manufacturing Lab	PC	2	0	0	4	25	75	100
M19 RD 1101	Research Methodology and IPR	RD	2	2	0	0	25	75	100
M19 AC 1109	Writing Skills forScientific Communication	AC	0	2	0	0	0	0	0
Total			**18**	**16**	**0**	**8**	**175**	**525**	**700**

	Course Code	Course
#PE-I	M19CAD 1103	Computational Methods in Engineering
	M19CAD 1104	Material Technology
	M19CAD 1105	Mechanical Vibrations
#PE-II	M19CAD 1106	Mechatronics
	M19CAD 1107	Industrial Robotics
	M19CAD 1108	Modelling and Simulation of Manufacturing Systems

CAD/CAM

SYLLABUS : GEOMETRIC MODELING (M19CAD1101)

UNIT-I : Cubic splines –I Definition, Explicit and implicit equations, parametric equations,Algebraic and geometric form of cubic spline, Hermite cubic spline, tangent vectors, parametric space of a curve, blending functions.

UNIT-II : Four point form, reparametrization, truncating and subdividing of curves. Graphic construction and interpretation, composite pc curves. Bezier Curves: Bernstein basis, equations of Bezier curves, properties, derivatives.

UNIT-III: B-Spline Curves: B-Spline basis, equations, knot vectors, properties, and derivatives.

UNIT-IV: Surfaces: Bicubic surfaces, Coon's surfaces, Bezier surfaces, B-Spline surfaces, surfaces of revolutions, Sweep surfaces, ruled surfaces, tabulated cylinder, bilinear surfaces, Gaussiancurvature

UNIT-V: Torsion of Prismatic bars – Bars with elliptical cross section – Other elementary solution – Membrane analogy – Torsion of rectangular bars – Solution of Torsional problems byenergy method.

Course Outcomes for First Semester Course	
Course Code: M19CAD1101	
Course Title: GEOMETRIC MODELING	
CO-1	Develop mathematical model store present cubic curves used for engineering applications.
CO-2	Develop mathematical model store present Bezier curves used for engineering applications.
CO-3	Select appropriate synthetic curves in modelling process
CO-4	Develop mathematical models to represent surfaces used for engineering applications.
CO-5	Model engineering components using solid modelling techniques.

SYLLABUS: COMPUTER AIDED MANUFACTURING (M19CAD1102)

UNIT-I: General information, APT programming, andExamples Apt programming problems (2D machining only). NC programming on CAD/CAM systems, the design and implementation of post processors .Introduction toCAD/CAM software, Automatic Tool Path generation.

UNIT-II: TOOLING FOR CNC MACHINES: Interchangeable tooling system, preset and qualified tools, coolant fed tooling system, modular fixturing, quick change tooling system, automatic head changers. DNC Systems and Adaptive Control: Introduction, type of DNC systems, advantages arid disadvantages of DNC, adaptive control with optimization, Adaptive control with constrains, Adaptive control of machining processes like turning, grinding.

UNIT-III: POST PROCESSORS FOR CNC: Introduction to Post Processors: The necessity of a Post Processor, the general structure of a Post Processor, the functions of a Post Processor, DAPP — based- Post Processor: Communication channels and major variables in the DAPP— based Post Processor, th creation of a DAPP — Based Post Processor.

UNIT-IV: MICRO CONTROLLERS: Introduction, Hardware components, I/O pins, ports, external memory:, counters, timers and serial data I/O interrupts. Selection of Micro ControllersEmbedded Controllers, Applications and Programming of Micro Controllers. Programmable Logic Controllers (PLC' s): Introduction, Hardware components of PLC, System, basic structure, principle of operations, Programming mnemonics timers, Internal relays and counters, Applications of PLC's in CNC Machines.

UNIT-V: COMPUTER AIDED PROCESS PLANNING: Hybrid CAAP System, Computer Aided Inspection and quality control, Coordinate Measuring Machine, Limitations of CMM, Computer Aided Testing, Optical Inspection Methods, Artificial Intelligence and expert system: Artificial Neural Networks, Artificial Intelligence in CAD, Experts systems and its structures.\

Course Outcomes for First Semester Course	
Course Code: M19CAD1102	
Course Title: Computer Aided Manufacturing	
CO-1	Understand the principles of NC, CNC and DNC technology and develop manual and computer aided part programming for turning and milling operations.
CO-2	Explain the concept of tooling for CNC machines.
CO-3	Apply the use of various transducers, Micro controllers, encoders and feedback devices in CAM
CO-4	Explain the concepts of group technology and cellular manufacturing.
CO-5	Understand the concepts of production planning & control and computer aided quality control.

SYLLABUS: COMPUTATIONAL METHODS IN ENGINEERING (M19CAD1103)
(Program Elective-I)

UNIT-I: Introduction to numerical methods applied to engineering problems: Examples, solving sets of equations – Matrix notation – Determinants and inversion – Iterative methods – Relaxation methods – System of non-linear equations. Least square approximation fitting of non-linear curves by least squares –regression analysis- multiple linear regression, non linear regression - computer programs

UNIT-II: Boundary value problems and characteristic value problems: Shooting method – Solutionthrough a set of equations – Derivative boundary conditions – Rayleigh – Ritz method –
Characteristic value problems.

UNIT-III: Transformation Techniques: Continuous fourier series, frequency and time domains, laplace transform, fourier integral and transform, discrete fourier transform (DFT), Fast fourier \transform (FFT).

UNIT-IV: Numerical solutions of partial differential equations: Laplace's equations – Representations as a difference equation – Iterative methods for Laplace's equations – poisson equation – Examples – Derivative boundary conditions – Irregular and non – rectangular grids – Matrix patterns, sparseness – ADI method – Finite element method.

UNIT-V: Partial differential equations: Explicit method – Crank-Nickelson method – Derivative boundary condition – Stability and convergence criteria. Solving wave equation by finite differences-stability of numerical method –method of characteristics-wave equation in two space dimensions-computer programs.

Course Outcomes for First Semester Course	
Course Code: M19CAD1103	
Course Title: COMPUTATIONAL METHODS IN ENGINEERING	
CO-1	Find the solutions of system of linear and non linear equations.
CO-2	Solve boundary value problems and characteristic value problems.
CO-3	Understand various transformation techniques.
CO-4	Understand Laplace and poisons equations
CO-5	Solve ordinary and partial differential equations numerically.

SYLLABUS: MATERIALS TECHNOLOGY (M19CAD1104)
(Program Elective-I)

UNIT-I: Elasticity in metals, mechanism of plastic deformation, slip and twinning, role of dislocations, yield stress, shear strength of perfect and real crystals, strengthening mechanism, work hardening, solid solution, grain boundary strengthening. Poly phase mixture, precipitation, particle, fiber and dispersion strengthening, effect of temperature,strain and strain rate on plastic behavior, super plasticity, Yield criteria: Von-mises and Tresca criteria..

UNIT-II: Griffth's Theory, stress intensity factor and fracture Toughness, Toughening Mechanisms,Ductile and Brittle transition in steel, High Temperature Fracture, Creep, Larson – Miller parameter, Deformation and Fracture mechanism maps.

UNIT-III: Integral Equations- Fatigue, fatigue limit, features of fatigue fracture,Low and High cycle fatigue test, Crack Initiation and Propagation mechanism and paris Law, Effect of surface and metallurgical parameters on Fatigue, Fracture of non-metallic materials, fatigue analysis, Sources of failure, procedure of failure analysis. Motivation for selection, cost basis and service requirements, Selection for Mechanical Properties, Strength, Toughness, Fatigue and Creep.

UNIT-IV: MODERN METALLIC MATERIALS: Dual Steels, Micro alloyed, High Strength Low alloy (HSLA) Steel, Transformation induced plasticity (TRIP) Steel, Maraging Steel, Inter metallics, Ni and Ti Aluminides. Processing and applications of Smart Materials, Shape Memory alloys, Metallic Glass Quasi Crystal and Nano Crystalline Materials.

UNIT-V: NONMETALLIC MATERIALS: Polymeric materials and their molecular structures, Production Techniques for Fibers, Foams, Adhesives and Coatings, structure, Properties and Applications of Engineering Polymers, Advanced Structural Ceramics WC, TiC, TaC, \$A1_2O_3$, SiC, Si_3N_4, CBN and Diamond – properties, Processing and applications.

Course Outcomes for First Semester Course	
Course Code: M19CAD1104	
Course Title: MATERIALS TECHNOLOGY	
CO-1	Gain knowledge on elastic & plastic deformation and strengthening mechanism of engineering materials.
CO-2	Learn the structure, properties and applications of modern metallic materials, smart materials non-metallic materials and advanced structural ceramics.
CO-3	Understand the fatigue and fracture failure mechanism of engineering materials.
CO-4	Understand the mechanical behaviour of modern metallic materials.
CO-5	Understand the mechanical behaviour of non metallic materials.

SYLLABUS: MECHANICAL VIBRATIONS (M19CAD1105)
(Program Elective-I)

UNIT-I: Single degree of Freedom systems: Undamped and damped free vibrations: forced vibrations ; coulomb damping; Response to harmonic excitation; rotating unbalance and support excitation, Vibration isolation and transmissibility, Vibrometers, velocity meters & accelerometers.

UNIT-II: Response to Non Periodic Excitations: unit Impulse, unit step and unit Ramp functions; response to arbitrary excitations, The Convolution Integral; shock spectrum; Systemresponse by the Laplace Transformation method.

UNIT-III: Multi degree freedom systems: Principal modes – undamped and damped free and forced vibrations; undamped vibration absorbers, Matrix formulation, stiffness and flexibility influence coefficients; Eigen value problem; normal modes and their properties; Free and forced vibration by Modal analysis; Method of matrix inversion; Torsional vibrations of multi – rotor systems and geared systems; Discrete-Time systems.

UNIT-IV Numerical Methods: Rayliegh's, Stodola's, Matrix iteration, Rayleigh-Ritz Method and Holzer's methods

UNIT-V: Application of concepts: Free vibration of strings – longitudinal oscillations of bars- transverse vibrations of beams- Torsional vibrations of shafts. Critical speeds without and with damping, secondary critical speed.

Course Outcomes for First Semester Course	
Course Code: M19CAD1105	
Course Title: MECHANICAL VIBRATIONS	
CO-1	Determine the natural frequencies of single and two degrees of freedom systems without and with damping.
CO-2	Develop a mathematical model for response to non periodic excitations
CO-3	Determine the natural frequencies of multi degrees of freedom systems
CO-4	Apply numerical methods to determine the natural frequencies and mode shapes.
CO-5	Determine the natural frequencies and mode shapes of bars in elongation and torsion and beams in bending.

SYLLABUS: MECHATRONICS (M19CAD1106)
(Program Elective-II)

UNIT-I: Mechatronics systems, elements, levels of mechatronics system, Mechatronics design process, system, measurement systems, control systems, microprocessor-based controllers, advantages and disadvantages of mechatronics systems. Sensors and transducers, types, displacement, position, proximity, velocity, motion, force, acceleration, torque, fluid pressure, liquid flow, liquid level, temperature and light sensors.

UNIT-II: Solid state electronic devices, PN junction diode, BJT, FET, DIA and TRIAC. Analog signal conditioning, amplifiers, filtering. Introduction to MEMS & typical applications.

UNIT-III: Hydraulic and pneumatic actuating systems, Fluid systems, Hydraulic and pneumatic systems, components, control valves, electro-pneumatic, hydro-pneumatic, electro- hydraulic servo systems: Mechanical actuating systems and electrical actuating systems.

UNIT-IV: Digital electronics and systems, digital logic control, micro processors and micro controllers, programming, process controllers, programmable logic controllers, PLCs versus computers, application of PLCs for control

.**UNIT-V:** System and interfacing and data acquisition, DAQS, SCADA, A to D and D to A conversions; Dynamic models and analogies, System response. Design of mechatronics systems & future trends

Course Outcomes for First Semester Course	
Course Code: M19CAD1106	
Course Title: MECHATRONICS	
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 correlation coefficient and regression.
CO-4	Use a computer language of their choice to solve problems using numerical methods covered in the course.

SYLLABUS: INDUSTRIAL ROBOTICS (M19CAD1107)
(Program Elective-II)

UNIT-I: INTRODUCTION: Automation and Robotics, Robot anatomy, robot configuration, motions joint notation scheme, work volume, robot drive systems, control systems and dynamic performance, precision of movement. CONTROL SYSTEM AND COMPONENTS: basic concepts and motion controllers, control system analysis, robot actuation and feedback components, Positions sensors, velocity sensors, actuators, power transmission systems, robot joint control design.

UNIT-II: MOTION ANALYSIS AND CONTROL: Manipulator kinematics, position representation, forward and inverse transformations, homogeneous transformations, manipulator path control, robot arm dynamics, configuration of a robot controller..

UNIT-III: END EFFECTORS: Grippers-types, operation, mechanism, force analysis, tools as end effectors consideration in gripper selection and design. SENSORS: Desirable features, tactile, proximity and range sensors, uses sensors in robotics. MACHINE VISION: Functions, Sensing and Digitizing-imaging devices, Lighting techniques, Analog to digital single conversion, image storage: Image processing and Analysis-image data reduction, Segmentation, feature extraction, Object recognition. Training the vision system, Robotic application.

UNIT-IV: ROBOT PROGRAMMING: Lead through programming, Robot program as a path in space, Motion interpolation, WAIT, SIGNAL AND DELAY commands, Branching, capabilitiesand Limitations of lead through methods. ROBOT LANGUAGES: Textual robot Languages, Generations of robot programming languages, Robot language structures, Elements and function.

UNIT-V: ROBOT CELL DESGIN AND CONTROL: Robot cell layouts-Robot centered cell, In-line robot cell, Considerations in work design, Work and control, Inter locks, Error detection, Work cell controller. ROBOT APPLICATION: Material transfer, Machine loading/unloading, Processing operation, Assembly and Inspection, Future Application.

Course Outcomes for First Semester Course	
Course Code: M19CAD1107	
Course Title: INDUSTRIAL ROBOTICS (Program Elective-2)	
CO-1	Distinguish between fixed automation and programmable automation and identify various componentsof robot.
CO-2	Understand the motion analysis of a robot.
CO-3	Understand the concepts of end effectors and machine vision used in Robots.
CO-4	Understand the concepts of robot programming and robot languages.
CO-5	Illustrate robot applications in manufacturing.

SYLLABUS: MODELING AND SIMULATION OF MANUFACTURING SYSTEMS (M19CAD1108) (Program Elective-II)

UNIT-I: Introduction to System and simulation: Concept of system and elements of system, Discrete and continuous system, Models of system and Principles of modeling and simulation, Monte carlo simulation, Types of simulation, Steps in simulation model, Advantages, limitations and applications of simulation, Applications of simulation in manufacturing System

UNIT-II: Review of statistics and probability: Types of discrete and continuous probability distributions such as Geometric, Poisson, Uniform, Geometric distribution with examples, Normal, Exponential distribution with examples.

UNIT-III: Random numbers: Need for RNs, Technique for Random number generation such as Mid product method, Mid square method, and Linear congruential method with examples Test for Random numbers: Uniformity - Chi square test or Kolmogorov Smirnov test,Independency- Auto correlation test Random Variate generation: Technique for Random variate generation such as Inverse transforms technique or Rejection method

UNIT-IV: Analysis of simulation data: Input data analysis, Verification and validation of simulation models, Output data analysis Simulation languages: History of simulation languages, Comparison and selection of simulation languages Design and evaluation of simulation experiments: Development and analysis of simulation models using simulation languagewith different manufacturing systems

UNIT-V: Queueing models: An introduction, M/M/1 and M/M/m Models with examples, Open Queueing and Closed queueing network with examples Markov chain models and others: Discrete time markov chain with examples, Continues time markov chain with examples, stochastic process in manufacturing, Game theory

Course Outcomes for First Semester Course	
Course Code: M19CAD1108 (ProgramElective-2)	
Course Title: MODELING AND SIMULATION OF MANUFACTURING SYSTEMS	
CO-1	Understand the concepts of system, elements of systems and types of simulation.
CO-2	Classify different discrete and continuous probability distributions.
CO-3	Gain knowledge on Generation of random numbers, random variants and variables.
CO-4	Build simulation model and also can verify and validate the model.
CO-5	Understand the concepts of queining models, markov chain models and game theory.

SYLLABUS: ADVANCED CAD LAB (M19CAD1109)

LIST OF EXERCISES

Students shall carry out the modeling and FE analysis of the following to predict deflection and stress distributions :

1. Trussess – 2D and 3D
2. Beams
3. Plate with Plane stress condition
4. Plate with Plane strain condition
5. Cylinders – Axi-symmetric condition
6. Natural frequencies of Beam

Course Outcomes for First Semester Course	
Course Code: M19CAD1109	
Course Title: ADVANCED CAD LAB	
CO-1	Perform stress analysis on 2D and 3D Trusses and
CO-2	Perform analysis on plates and axi-symmetrical components.
CO-3	Execute frequency analysis on beams and 2D components.

SYLLABUS: ADVANCED MANUFACTURING LAB (M19CAD1110)

LIST OF EXPERIMENTS

1. Casting processes - Study of Solidification, temperatures, metallurgical phases.
2. Forging processes - Study of hot working processes and extrusion
3. Forming Processes – Study of blanking, bending and deep drawing
4. Welding Processes – Study of arc, and spot welding processes
5. Powder metallurgy- Study of Green Density and sintering density
6. Additive Manufacturing – Study of simple parts in 3D printing
7. .Machining- Estimation of chip reduction coefficient and shear angle in orthogonal turning,
8. Measurement of cutting forces and average cutting temperature, and Estimation of tool life of a single point turning tool.

Course Outcomes for First Semester Course	
Course Code: M19CAD1110	
Course Title: ADVANCED MANUFACTURING LAB	
CO-1	Identify and select proper manufacturing process for the manufacturing of parts.
CO-2	Manufacture parts using basic and advanced manufacturing processes.
CO-3	Build a 3D printed engineering component.

SYLLABUS: RESEARCH METHODOLOGY AND IPR (M19RD1101)
(Common to CST,CS,PSA, IT & CAD/CAM)

UNIT-I: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT-II: Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format ofresearch proposal, a presentation and assessment by a review committee

UNIT-III: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT-IV: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications

UNIT-V: New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs

Course Outcomes for First Semester Course	
Course Code: M19RD1101	
Course Title: RESEARCH METHODOLOGY AND IPR	
CO-1	Analyze research related information
CO-2	Formulate a Research Proposals and Publish papers with research ethics
CO-3	Award for Intellectual Property Rights like Patents, Trade and Copyrights
CO-4	Analyze Various Intellectual Property Rights
CO-5	Assess New Developments of IPRs in National and International level

SYLLABUS: WRITING SKILLS FOR SCIENTIFIC COMMUNICATION (M19AC1109)

UNIT-I: Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness**,** Clarifying Who Did What, Highlighting Your Findings, Hedging andCriticising

UNIT-II: Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-III: Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review ofthe Literature.

UNIT-IV: Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions.

UNIT-V: Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Course Outcomes for First Semester Course	
Course Code: M19AC1109	
Course Title: WRITING SKILLS FOR SCIENTIFIC COMMUNICATION	
CO-1	Understand that how to improve your writing skills and level of readability
CO-2	Learn about what to write in each section
CO-3	Understand the skills needed when writing a Title Ensure the good quality of paper at very first time submission

Regulation: R19 | **I / IV - B.Tech. II - Semester**

MECHANICAL ENGINEERING(CAD/CAM)
(Under Choice Based Credit System / Elective Course System)

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2019-20 admitted Batch onwards)

Course Code	Course Name	Category	Cr.	L	T	P	Int. Marks	Ext. Marks	Total Marks
M19CAD 1201	Theory of Elasticityand Plasticity	PC	3	3	0	0	25	75	100
M19CAD 1202	Advanced Manufacturing Processes	PC	3	3	0	0	25	75	100
#PE-III	Program Elective-III	PE	3	3	0	0	25	75	100
#PE-IV	Program Elective-IV	PE	3	3	0	0	25	75	100
M19CAD 1209	Computer Aided Machining Lab	PC	2	0	0	4	25	75	100
M19CAD 1210	Robotics Lab	PC	2	0	0	4	25	75	100
M19CAD 1211	Mini Project With Seminar	MP	2	2	0	4	100	--	100
#AC	Audit Course	AC	0	2	0	0	0	0	0
Total			**18**	**14**	**18**	**16**	**0**	**12**	**250**

	Course Code	Course
#PE-III	M19CAD 1203	Advanced Finite Element Methods
	M19CAD 1204	Fracture Mechanics
	M19CAD 1205	Product Design and Development
#PE-IV	M19CAD 1206	Materials Characterization Techniques
	M19CAD 1207	Optimization & Reliability
	M19CAD 1208	Additive Manufacturing

	Course Code	Course
#AC	M19AC 0005	Constitution of India
	M19AC 0006	Pedagogy studies
	M19AC 0008	Personality development through life enlightenment skills

CAD/CAM

SYLLABUS THEORY OF ELASTICITY AND PLASTICITY (M19CAD1201)

UNIT-I: INTRODUCTION: Elasticity –Notation for forces and stresses-Components of stresses – components of strain –Hooke's law.**PLANE STRESS AND PLANE STRAIN ANALYSIS:** Plane stress-plane strain-Differential equations of equilibrium- Boundary conditions- Compatibility equations-stress function-Boundary conditions.

UNIT-II: TWO DIMENSIONAL PROBLEMS IN RECTANGULAR COORDINATES: Solution by polynomials-Saint Venant's principle-Determination of displacements-bending of simple beams-application of Fourier series for two dimensional problems - gravity loading.

TWO DIMENSIONAL PROBLEMS IN POLAR COORDINATES : General Equation in polar co-ordinates - stress distribution symmetrical about an axis –Pure bending of curved bars- strain components in polar coordinates-Displacements for symmetrical stress distributions- simple symmetric and asymmetric problems-General solution of two dimensional problem in polar coordinates-Application of the general solution of two dimensional problem in polar coordinates-Application of the general solution in polar coordinates.

UNIT-III: ANALYSIS OF STRESS AND STRAIN IN THREE DIMENSIONS: Principle stress - ellipsoid and stress-director surface-Determination of principle stresses- Maximum shear stresses-Homogeneous deformation-principle axis of strain rotation.

GENERAL THEOREMS: Balance laws - Differential equations of equilibrium- conditions of compatibility - Determination of displacement-Equations of equilibrium in terms of displacements-principle of superposition-Uniqueness of solution –the Reciprocal theorem.

UNIT-IV: TORSION OF PRISMATIC BARS: General solution of problems by displacement (St. Venant's warping function) & force (Prandtl's stress function) approaches - Membrane analogy - Torsion of circular and non-circular (elliptic and rectangular) sections - Torsion of thin rectangular section and hollow thin walled section - Single and multi-celled sections.

UNIT-V: THEORY OF PLASTICITY: Stress-strain curve - Theories of strength and failure –Yield Criteria - Yield Surface – Plastic Flow – Plastic Work – Plastic Potential – Strain hardening

Course Outcomes for Second Semester Course	
Course Code: M19CAD1201	
Course Title: THEORY OF ELASTICITY AND PLASTICITY	
CO-1	Apply to concepts to solve the problems of 3-D elasticity
CO-2	Students can independently work with the problems of 2-D elasticity in Cartesian/Polar Coordinates.
CO-3	Apply the use of airy's stress function in 2-D problems of elasticity in Cartesian/Polar Coordinates.
CO-4	Students will be equipped with the knowledge of various theories of torsion of prismatic bars of variouscross sections and can solve the problems of torsion.
CO-5	Understand the concepts of plasticity.

SYLLABUS: ADVANCED MANUFACTURING PROCESSES (M19CAD1202)

UNIT-I: SURFACE TREATMENT: Scope, Cleaners, Methods of cleaning, Surface coating types, ceramic and organic methods of coating, and economics of coating. Electro forming, Chemical vapor deposition, Physical vapor deposition, thermal spraying, Ion implantation, diffusion coating, Diamond coating and cladding.

UNIT-II: PROCESSING OF CERAMICS: Applications, characteristics, classification .Processing of particulate ceramics, Powder preparations, consolidation, hot compaction, drying, sintering, and finishing of ceramics, Areas of application.

PROCESSING OF COMPOSITES: Composite Layers, Particulate and fiber reinforced composites, Elastomers, Reinforced plastics, MMC, CMC, Polymer matrix composites

UNIT-III: FABRICATION OF MICROELECTRONIC DEVICES: Crystal growth and wafer preparation, Film Deposition oxidation, lithography, bonding and packaging, reliability and yield, Printed Circuit boards, computer aided design in micro electronics, surface mount technology, Integrated circuit economics.

UNIT-IV: ADVANCED MACHINING PROCESSES: AJM, WJM, WireEDM, ECM, LBM, EBM, PAM – Principle, working, limitations and applications.

UNIT-V: RAPID PROTOTYPING: Working Principles, Methods, Stereo Lithography, Laser Sintering, Fused Deposition Method, Applications and Limitations, Rapid tooling, Techniques of rapid manufacturing

Course Outcomes for Second Semester Course	
Course Code: M19CAD1202	
Course Title: ADVANCED MANUFACTURING PROCESSES	
CO-1	Understand the principles of various surface treatment processes.
CO-2	Understand different processing types of ceramics & composite materials.
CO-3	Understand the various technologies related to fabrication of microelectronic devices.
CO-4	Understand the working principle of various advanced machining processes.
CO-5	Understand the concepts of Rapid prototyping and rapid tooling.

SYLLABUS: ADVANCED FINITE ELEMENT METHODS (M19CAD1203)
(Program Elective-III)

UNIT-I: Formulation Techniques: Methodology, Engineering problems and governing differential equations, finite elements., Variational methods-potential energy method, Raleigh Ritz method, strong and weak forms, Galerkin and weighted residual methods, calculus of variations, Essential and natural boundary conditions.

UNIT-II: One-dimensional elements: Bar, trusses, beams and frames, displacements, stresses and temperature effects.

UNIT-III: Two dimensional problems: CST, LST, four noded and eight nodded rectangular elements, Lagrange basis for triangles and rectangles, serendipity interpolation functions. Axisymmetric Problems:Axisymmetric formulations, Element matrices, boundary conditions. Heat Transfer problems: Conduction and convection, examples: - two- dimensional fin.

UNIT-IV: Isoparametric formulation: Concepts, sub parametric, super parametric elements, numerical integration, Requirements for convergence, h-refinement and p-refinement, complete and incomplete interpolation functions, pascal's triangle, Patch test.

UNIT-V: Finite elements in Structural Analysis: Static and dynamic analysis, eigen value problems, and their solution methods, case studies using commercial finite elementpackages.

Course Outcomes for Second Semester Course	
Course Code: M19CAD1203	
Course Title: ADVANCED FINITE ELEMENT METHODS (Program Elective-1)	
CO-1	Apply variational and weighted residual methods to solve differential equations
CO-2	Analyse structural members such as 1-D bar, trusses, beams and frames using finite element method.
CO-3	Analyse two dimensional problems, axi-symmetric problems and heat conduction problems using finiteelement method.
CO-4	Understand the concepts of iso, sub and super parametric formulation and numerical integration.
CO-5	Analyse vibration problems for frequencies and mode shapes.

SYLLABUS: FRACTURE MECHANICS (M19CAD1204)

UNIT-I: Introduction: Prediction of mechanical failure. Macroscopic failure modes; brittle and ductile behaviour. Fracture in brittle and ductile materials – characteristics of fracture surfaces; inter- granular and intra-granular failure, cleavage and micro-ductility, growth of fatigue cracks, The ductile/brittle fracture transition temperature for notched and unnotched components. Fracture at elevated temperature.

UNIT-II: Griffiths analysis: Concept of energy release rate, G, and fracture energy, R. Modification for ductile materials, loading conditions. Concept of R curves.

Linear Elastic Fracture Mechanics, (LEFM): Three loading modes and the state of stress ahead of the crack tip, stress concentration factor, stress intensity factor and the material parameter the critical stress intensity factor, crack tip plasticity, effect of thickness on
fracture toughness.

UNIT-III: Elastic-Plastic Fracture Mechanics (EPFM): The definition of alternative failure prediction parameters, Crack Tip Opening Displacement, and the J integral. Measurement of parameters and examples of use.

UNIT-IV: Fatigue: definition of terms used to describe fatigue cycles, High Cycle Fatigue, Low Cycle Fatigue, mean stress R ratio, strain and load control. S-N curves. Goodmans rule and Miners rule. Micro-mechanisms of fatigue damage, fatigue limits and initiation and propagation control, leading to a consideration of factors enhancing fatigue resistance. Total life and damage tolerant approaches to life prediction.

UNIT-V: Creep deformation: the evolution of creep damage, primary, secondary and tertiary creep. Micro-mechanisms of creep in materials and the role of diffusion. Ashby creep deformation maps. Stress dependence of creep – power law dependence. Comparison of creep performance under different conditions – extrapolation and the use of Larson-Miller parameters. Creep-fatigue interactions. Examples.

Course Outcomes for Second Semester Course	
Course Code: M19CAD1204	
Course Title: FRACTURE MECHANICS (Program Elective-III)	
CO-1	Determine stress intensity factors by applying Linear Elastic and Elastic plastic fracture mechanics.
CO-2	Apply fatigue concepts in predicting the life of Components.
CO-3	Formulate and solve problems involving the static, fatigue or impact loading of flawed structures

SYLLABUS: PRODUCT DESIGN AND DEVELOPMENT (M19CAD1205)
(Program Elective-III)

UNIT-I: Introduction: Classification/Specifications of Products, Product life cycle. Product mix, Introduction to product design, Modern product development process, Innovative thinking.

UNIT-II: Morphology of design. Conceptual Design: Generation, selection & embodiment ofconcept. Product architecture, Industrial design: process, need, Robust Design: Taguchi Designs & DOE, Design Optimization.

UNIT-III: Design for Mfg& Assembly: Methods of designing for Manufacturing and assembly,Designs for Maintainability, Designs for Environment, Product costing, Legal factors and social issues, Engineering ethics and issues of society related to design of products. Value Engineering / Value Analysis. : Definition. Methodology, Case studies.

UNIT-IV: Economic analysis: Qualitative & Quantitative. Ergonomics / Aesthetics: Gross human autonomy, Anthropometry, Man-Machine interaction, Concepts of size and texture, colour .Comfort criteria, Psychological & Physiological considerations.

UNIT-V: Creativity Techniques: Creative thinking, conceptualization, brain storming, primary design, drawing, simulation, detail design. Concurrent Engineering, Rapid prototyping, Tools for product design – Drafting / Modeling software, CAM Interface, Patents & IP
Acts. Overview, Disclosure preparation.

Course Outcomes for Second Semester Course	
Course Code: M19CAD1205	
Course Title: PRODUCT DESIGN AND DEVELOPMENT (Program Elective-III)	
CO-1	Identify and analyse the product design and development processes in manufacturing industry.
CO-2	Define the components and their functions of product design and development processes and their relationships from concept to customer over whole product lifecycle.
CO-3	Analyse, evaluate and apply the methodologies for product design, development and management.
CO-4	Undertake a methodical approach to the management of product development to satisfy customer needs.

SYLLABUS: MATERIALS CHARACTERIZATION TECHNIQUES (M19CAD1206)
(Program Elective-IV)

UNIT-I: Introduction to materials and Techniques,Structure analysis tools: X-ray diffraction: phase identification, indexing and lattice parameter determination, Analytical line profile fitting using various models, Neutron diffraction, Reflection High Energy Electron Diffraction, and Low Energy Electron Diffraction.

UNIT-II: Microscopy techniques: Optical microscopy, transmission electron microscopy (TEM), energy dispersive X-ray microanalysis (EDS), scanning electron microscopy (SEM), Rutherford backscattering spectrometry (RBS), atomic force microscopy (AFM) and scanning probe microscopy (SPM).

UNIT-III: Thermal analysis technique: Differential thermal analysis (DTA), Differential Scanning Calorimetry (DSC), Thermogravimetric analysis (TGA); Electrical characterization techniques: Electrical resistivity, Hall effect, Magnetoresistance.

UNIT-IV: Magnetic characterization techniques: Introduction to Magnetism, Measurement Methods, Measuring Magnetization by Force, Measuring Magnetization by Induction method, Types of measurements using magnetometers: M-H loop, temperature dependent magnetization, time dependent magnetization, Measurements using AC susceptibility, Magneto-optical Kerr effect, Nuclear Magnetic Resonance, Electron Spin Resonance.

UNIT-V: Optical and electronic characterization techniques: UV-VIS spectroscopy, Fourier transform infrared spectroscopy, Raman spectroscopy, X-ray photoelectron spectroscopy.

Course Outcomes for Second Semester Course	
Course Code: M19CAD1206(Program Elective-IV)	
Course Title: MATERIALS CHARACTERIZATION TECHNIQUES	
CO-1	Apply appropriate characterization techniques for microstructure examination at different magnification level and use them to understand the microstructure of various materials
CO-2	Choose and appropriate electron microscopy techniques to investigate microstructure of materials at high resolution
CO-3	Understand the principles of various thermal analysis techniques
CO-4	Understand the principles of Magnetic characterization techniques
CO-5	Understand the principles of Optical and electronic characterization techniques.

SYLLABUS: OPTIMIZATION & RELIABILITY (M19CAD1207)
(Program Elective-IV)

UNIT-I: CLASSICAL OPTIMIZATION TECHNIQUES: Single variable optimization with and without constraints, multi – variable optimization without constraints, multi – variable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions, merits and demerits of classical optimization techniques.

UNIT-II: NUMERICAL METHODS FOR OPTIMIZATION: Nelder Mead's Simplex search method, Gradient of a function, Steepest descent method, Newton's method, Pattern search methods, conjugate method, types of penalty methods for handling constraints, advantages of numerical methods.

UNIT-III: GENETIC ALGORITHM (GA) : Differences and similarities between conventional and evolutionary algorithms, working principle, reproduction, crossover, mutation, termination criteria, different reproduction and crossover operators, GA for constrained optimization, draw backs of GA,
GENETIC PROGRAMMING (GP): Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, random population generation, solving differential equations using GP.
MULTI-OBJECTIVE GA: Pareto's analysis, Non-dominated front, multi – objective GA, Non-dominated sorted GA, convergence criterion, applications of multi-objective problems.

UNIT-IV: APPLICATIONS OF OPTIMIZATION IN DESIGN AND MANUFACTURING SYSTEMS: Some typical applications like optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam, optimization of springs and gears, general optimization model of a machining process, optimization of arc welding parameters, and general procedure in optimizing machining operations sequence.

UNIT-V: RELIABILITY: Concepts of Engineering Statistics, risk and reliability, probabilistic approach to design, reliability theory, design for reliability, numerical problems, hazardanalysis.

Course Outcomes for Second Semester Course	
Course Code: M19CAD1207	
Course Title: OPTIMIZATION & RELIABILITY(Program Elective-IV)	
CO-1	Understanding the concepts of conventional, unconventional optimization algorithms.
CO-2	Formulate engineering design problems as mathematical optimization problems and solve them by using suitable optimization techniques.
CO-3	Understand the concepts of Genetic Algorithm, Genetic programming and multi objective GeneticAlgorithm.
CO-4	Apply the concepts of optimization in design and manufacturing.
CO-5	Understand the basic concepts of reliability.

SYLLABUS: ADDITIVE MANUFACTURING (M19CAD1208)
(Program Elective-IV)

UNIT-I: Additive Manufacturing Process: Basic Principles of the Additive Manufacturing Process, Generation of Layer Information, Physical Principles for Layer Generation. Elements for Generating the Physical Layer, Classification of Additive Manufacturing Processes, Evaluation of the Theoretical Potentials of Rapid Prototyping Processes.

UNIT-II: Machines for Rapid Prototyping: Overview of Polymerization: Stereolithography (SL), Sintering/Selective Sintering: Melting in the Powder Bed, Layer Laminate Manufacturing (LLM) and Three-Dimensional Printing (3DP).

UNIT-III: Rapid Prototyping: Classification and Definition, Strategic Aspects for the Use of Prototypes, Applications of Rapid Prototyping in Industrial Product Development. Rapid Tooling: Classification and Definition of Terms, Properties of Additive ManufacturedTools, Indirect Rapid

UNIT-IV: Tooling Processes: Molding Processes and Follow-up Processes, Indirect Methods for the Manufacture of Tools for Plastic Components, Indirect Methods for the Manufacture ofMetal Components.

UNIT-V: Direct Rapid Tooling Processes: Prototype Tooling: Tools Based on Plastic Rapid Prototyping Models and Methods, Metal Tools Based on Multilevel AM Processes, Direct Tooling: Tools Based on Metal Rapid Prototype Processes.

Course Outcomes for Second Semester Course	
Course Code: M19CAD1208	
Course Title: ADDITIVE MANUFACTURING(Program Elective-IV)	
CO-1	Understand the concepts of Additive Manufacturing and Rapid Prototyping technologies.
CO-2	Classify and explain principles of various machines used for rapid prototyping.
CO-3	Understand the concepts of tooling processes and direct rapid tooling processes.

SYLLABUS: COMPUTER AIDED MACHINING LAB (M19CAD1209)

LIST OF EXERCISES

1. Introduction to Manual part programming and features of CNC Turning and Milling Centres.
2. Preparation of manual part programme for Turning and drilling operations using point-topoint,Linear and circular interpolation Techniques.
3. Preparation of manual part programme for Milling operations using point-to-point, Linear and circular interpolation Techniques.
4. Part programming using Fixed or Canned Cycles for Drilling, Peck drilling, Boring, Tapping and Thread cutting operations.
5. Generation of Tool path, NC code and its Simulation for Turning and Milling operations using any one CAM packages like EdgeCAM, MasterCAM and Off-line NC simulation softwares.
6. Computer Assisted Part Programme generation using APT language.
7. Machining of simple components on CNC lathe machine
8. Machining of simple components on CNC Milling machine

Course Outcomes for Second Semester Course	
Course Code: M19CAD1209	
Course Title: COMPUTER AIDED MACHINING LAB	
CO-1	Demonstrate part programming for CNC lathe and mill and execute the same for the part production.
CO-2	Develop the manufacturing of components through CAM Software

SYLLABUS: ROBOTICS LAB (M19CAD1210)

LIST OF EXPERIMENTS

1. Introduction to programming in MATLAB.
2. Introduction to Simulink: Modeling and simulation of spring-mass-damper system.
3. Modeling and simulation of 2-R manipulator using Simulink.
4. Development of PID control for DC motor.
5. Joint space and and work space control of 2R manipulator.
6. Forward and Inverse kinematics of robot manipulator using Robo-Analyzer software
7. Pick and place operation using a 4-DOF robotic manipulator.
8. Collaborative manipulation using two robotic manipulators.

Course Outcomes for Second Semester Course	
Course Code: M19CAD1210	
Course Title: ROBOTICS LAB	
CO-1	Understand the dynamic simulation of robot manipulator using MATLAB.
CO-2	Learn the dynamic modelling and control of robot manipulator using Simulink.
CO-3	Develop in-depth knowledge of forward and inverse kinematics and dynamics using open-source robot software.
CO-4	Learn and gain practical knowledge of different components of physical robot.
CO-5	Understand programming of robot manipulator for various operations.

SYLLABUS: MINI PROJECT WITH SEMINAR (M19CAD1211)

MINI PROJECT WITH SEMINAR

For Mini Project with Seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report formand shall make an oral presentation before the Project Review Committee consisting of Head of the Department, supervisor/mentor and two other senior faculty members of the department. For Mini Project with Seminar, there will be only internal evaluation of 100 marks.A candidate has to secure a minimum of 50% of marks to be declared successful.

SYLLABUS: CONSTITUTION OF INDIA (M19AC0005)

UNIT-I: History of Making of the Indian Constitution: History , Drafting Committee, (Composition & Working)

UNIT-II: Philosophy of the Indian Constitution: Preamble ,Salient Features

UNIT-III: Fundamental Rights,Right to Equality, Right to Freedom,Right against Exploitation, Right to Freedom of Religion,Cultural and Educational Rights,Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties

UNIT-IV: Organs of Governance:

Parliament, Composition, Qualifications and Disqualifications ,Powers and Functions, Executive, President , Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

Local Administration:

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zilla Panchayat. Elected officials and their roles, CEO Zilla Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments),Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT-V: Election Commission: Election Commission: Role and Functioning. Chief ElectionCommissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Course Outcomes for Second Semester Course	
Course Code: M19AC0005	
Course Title: CONSTITUTION OF INDIA	
CO-1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO-2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
CO-3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under theleadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
CO-4	Discuss the passage of the Hindu Code Bill of 1956.

SYLLABUS: PEDAGOGY STUDIES (M19AC0006)

UNIT-I: Introduction and Methodology:

Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.

UNIT-II: Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries, Curriculum, Teacher education.

UNIT-III: Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effectivepedagogy.

UNIT-IV: Theory of change, Strength and nature of the body of evidence for effective pedagogical practices Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies. Professional development: alignment with classroom practices and follow-up support

UNIT-V: Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

SYLLABUS: PERSONALITY DEVELOPMENT THROUGH LIFEENLIGHTENMENT SKILLS (M19AC0008)

UNIT-I: Neetisatakam-Holistic development of personality

Verses- 19,20,21,22 (wisdom)

Verses- 29,31,32 (pride & heroism)Verses- 26,28,63,65 (virtue)

UNIT-II: Neetisatakam-Holistic development of personality

Verses- 52,53,59 (dont's)

Verses- 71,73,75,78 (do's)

Approach to day to day work and duties.

Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,

UNIT-III: Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,

Chapter 18-Verses 45, 46, 48.

UNIT-IV: Statements of basic knowledge.

Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68

Chapter 12 -Verses 13, 14, 15, 16,17, 18

UNIT-V: Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42,

Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63

Course Outcomes for Second Semester Course	
Course Code: M19AC0008	
Course Title: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGH TENMENT SKILLS	
CO-1	Study of Shrimad- Bhagwad- Geeta will help the student in developing his personality and achieve the highest goal in life.
CO-2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity.
CO-3	Study of Neetishatakam will help in developing versatile personality of students.

Regulation: R19							**II / IV - B.Tech. I - Semester**		
MECHANICAL ENGINEERING(CAD/CAM) **(Under Choice Based Credit System / Elective Course System)**									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2019-20 admitted Batch onwards)									
Course Code	**Course Name**	**Category**	**Cr.**	**L**	**T**	**P**	**Int. Marks**	**Ext. Marks**	**Total Marks**
#PE-V/ MOOCS	Program Elective-V	PE	3	3	0	0	25	75	100
#OE/MOOCS	Open Elective	OE	3	3	0	0	25	75	100
M19CAD2106	**Dissertation-I / Industrial Project**	PR	10	0	0	20	50	50	100
TOTAL			**16**	**6**	**0**	**20**	**100**	**200**	**300**

	Course Code	**Course**
#PE-V/ MOOCS	M19CAD 2101	Non Destructive Evaluation
	M19CAD 2102	Quality Engineering
	M19CAD 2103	Green Manufacturing
	M19CAD 2104 (MOOCS-I)	Students Going for Industrial Project / Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a 12 weeks' course duration in PG level with 3 credits, but the chosen subject should not be covered in their M. Tech Course
#OE/ MOOCS	#OE	Students have to choose one open elective course offered by departments other than the parent department. List of open Electives offered by other departments are enclosed.
	M19CAD 2105 (MOOCS-II)	Students Going for Industrial Project / Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a 12 weeks' course duration in PG level with 3 credits, but the chosen subject should not be covered in their M. Tech Course

OPEN ELECTIVES OFFERED TO OTHER DEPARTMENTS	
M19CAD 2107	Operations Research
M19CAD 2108	Nano Technology
M19CAD 2109	Product Design & Manufacturing

CAD/CAM

SYLLABUS : NON DESTRUCTIVE EVALUATION (M19CAD2101)

(Program Elective-V)

UNIT-I : General Methods: Flaw Detection Using Dye Penetrants. Magnetic Particle Inspection, introduction to electrical impedance, Principles of Eddy Current testing, Flaw detection using eddy currents.

UNIT-II : X-Ray Radiography: The Radiographic process, X-Ray and Gamma-ray sources, Geometric Principles, Factors Governing Exposure, Radio graphic screens, Scattered radiation, Arithmetic of exposure, Radiographic image quality and detail visibility, Industrial X-Ray films, Fundamentals of processing techniques, Process control, The processing Room, Special Processing techniques, Paper Radiography, Sensitometric characteristics of x-ray films, Film graininess signal to noise ratio in radiographs, The photographic latent image, Radiation Protection.

UNIT-III: Generation of ultrasonic waves, Horizontal and shear waves, Near field and far field acoustic wave description, Ultrasonic probes- straight beam, direct contact type, Angle beam, Transmission/reflection type, and delay line transducers, acoustic coupling and media, Transmission and pulse echo methods, A-scan, B-scan, C-scan, F-scan and P-scan modes, Flaw sizing in ultrasonic inspection: AVG, Amplitude, Transmission, TOFD, Satellite pulse, Multi- modal transducer, Zonal method using focused beam. Flow location methods, Signal processing in Ultrasonic NDT; Mimics, spurious echos and noise. Ultrasonic flaw evaluation.

UNIT-IV: Holography: Principles and practices of Optical holography, acoustical, microwave, x-rayand electron beam holography techniques.

UNIT-V: Applications: NDT in flaw analysis of Pressure vessels, piping, NDT in Castings, Welded

Course Outcomes for Third Semester Course	
Course Code: M19CAD2101	
Course Title: NON DESTRUCTIVE EVALUATION(Program Elective-V)	
CO-1	The student shall be able to select an appropriate NDT technique as per requirement.
CO-2	Understand the theoretical and practical aspects of the radiographic testing, interpretation and evaluation.
CO-3	Acquire basic knowledge of ultrasonic testing which enables them to perform inspection of samples.
CO-4	Understand the principle of optical holography and its applications in NDT.
CO-5	Apply various NDTs for flaw analysis of pressure vessels, piping, welded joints, casted parts.

SYLLABUS: QUALITY ENGINEERING (M19CAD2102)
(Program Elective-V)

UNIT-I: QUALITY VALUE AND ENGINEERING: An overall quality system, quality engineering in production design, quality engineering in design of production processes. Loss Function and Quality Level: Derivation and use of quadratile loss function, economic consequences of tightening tolerances as a means to improve quality, evaluations and types tolerances.(N-type,S-type and L-type)

UNIT-II: TOLERANCE DESIGN AND TOLERANCING: Functional limits, tolerance design for N-type. L-type and S-type characteristics, tolerance allocation for multiple components. Parameter and Tolerance Design: Introduction to parameter design, signal to noise ratios, Parameter design strategy, some of the case studies on parameter and tolerance designs

UNIT-III: DOE: DOE process steps, Observation method, Ranking method, Column effects method and Plotting method.

ANALYSIS OF VARIANCE (ANOVA): Introduction to ANOVA, Need for ANOVA, NO-way ANOVA, One-way ANOVA, Two-way ANOVA, Critique of F-test, ANOVA for four level factors, multiple level factors.

UNIT-IV: ORTHOGONAL ARRAYS: Typical test strategies, better test strategies, efficient test strategies, steps in designing, conducting and analyzing an experiment. Interpolation of Experimental Results: Interpretation methods, percent contributor, estimating the mean.

UNIT-V: SIX SIGMA AND THE TECHNICAL SYSTEM: Six sigma DMAIC methodology, tools for process improvement, six sigma in services and small organizations, statistical foundations, statistical methodology..

Course Outcomes for Third Semester Course	
Course Code: M19CAD2102	
Course Title: QUALITY ENGINEERING (Program Elective-V)	
CO-1	Understand the concepts of Quality value and Engineering.
CO-2	Understand the concepts of Tolerance design and tolerancing.
CO-3	Understand the principles of DOE and ANOVA.
CO-4	Understand the concepts of orthogonal arrays.
CO-5	Understand the principles of six sigma and the technical system.

SYLLABUS: GREEN MANUFACTURING (M19CAD2103)
(Program Elective-V)

UNIT-I: INTRODUCTION TO MANUFACTURING Definition of manufacturing, Impact of manufacturing in environmental ecology, Role of manufacturing sector in national growth, Technological change and evolving risk , concepts of "green" manufacturing need of green manufacturing ,Green manufacturing strategies , Green manufacturing – motivation, barriers, regulation, policy , Casting defects and remedies. , Advantages and limitations of green manufacturing.

UNIT-II: GREEN MANUFACTURING TOOLS Principles of green manufacturing and its efficiency, Green manufacturing and sustainability , System model architecture and module, Design and planning, control or tools for green manufacturing (Qualitative Analysis, Consumption Analysis, Life Cycle Analysis, Efficiency, Sustainability tools) Standards for green manufacturing (ISO 14000 and OHSAS 18000 , Waste stream mapping and application Identify and apply the concepts of product and process design with environmental forethought, Design for environment and for sustainability -Discuss the Product Life Cycle of manufactured goods.

UNIT-III: ATTRIBUTES DECISION MAKING METHODS Introduction to Multi attributes decision making methods, definition, structure for Multi attributes decision making, Reference methods variants and analysis of different methods like Simple Additive Method (SAM) Weighted Product Method (WPM. Analytic Hierarchy Process (AHP) Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), Grey Relation Analysis (GRA Elimination and Choice Expressing Reality (ELECTRE) ViseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR), Problems based on different MADMs.

UNIT-IV: CREATING LEAN AND GREEN ORGANISATION Question wasteful practices Gain lean and green endorsement, collaboration to achieve lean and green goals Track progress for environment and profits Creation of sustainable growth Enabling techniques for assuring green manufacturing, Drivers of green manufacturing, impact, advantages and disadvantages of drivers, Green architecture and buildings, Sustainable manufacturing resources management , Carbon footprint analysis and management of manufacturing processes , Green Process Economics, Resource Recovery and Reuse.

UNIT-V: CASE STUDIES IN GREEN MANUFACTURING Design resources saving into product and processes , Closed loop & Open Loop production system , Green manufacturing through clean energy supply , semiconductors manufacturing , Various case studies of implementation of semiconductors manufacturing at industries , Green packaging and supply chain, Various case studies of implementation of Optimizing Logistics solution at industries , Environmental implication of Nanomanufacturing , Various case studies of implementation of lean manufacturing at industries Various case studies of implementation of Optimizing process or product at industries.

Course Outcomes for Third Semester Course	
Course Code: M19CAD2103	
Course Title: GREEN MANUFACTURING(Program Elective-V)	
CO-1	Understand the basic design concepts, methods, tools, the key technologies and the operation of sustainable green manufacturing.
CO-2	Understand the basic concepts of green manufacturing tools.
CO-3	Understand the basic concepts of various attributes decision making methods.
CO-4	Identify the strategies for the purpose of satisfying a set of given sustainable green manufacturing requirements
CO-5	Design the rules and processes to meet the market need and the green manufacturing requirements byselecting and evaluating suitable technical, managerial/project management and supply chain management scheme.

SYLLABUS: MOOCS-I (M19CAD2104)

Students Going for Industrial Project/ Thesis will complete these courses through MOOCS. Students can also choose SWAYAM o NPTEL with a 12weeks' course duration in PG level with 3 credits, but the chosen subject should not be covered in their M.Tech Course

OPENELECTIVE

Offered from	Course Code	Course Name	Offered to
CIVIL ENGINEERING	M19 ST 2107	Construction Management	**CST, CS, PSA,IT & CAD/CAM**
	M19 ST 2108	Green Technology	
	M19 ST 2109	Analysis of Offshore Structures	
COMPUTER SCIENCE & ENGINEERING	M19 CST 2106	Python Programming	**ST, CS, PSA & CAD/CAM**
	M19 CST 2107	Artificial Intelligence	
	M19 CST 2108	Advanced Data structures	
ELECTRONICS & COMMUNICATION ENGINEERING	M19 CS 2107	Signals and systems	**ST, CST, PSA, IT & CAD/CAM**
	M19 CS 2108	Principles of Communication	
	M19 CS 2109	Image and video Processing	
ELECTRICAL & ELECTRONICS ENGINEERING	M19PS2107	Electric And Hybrid Vehicles	**ST, CST, CS, IT & CAD/CAM**
	M19PS2108	Energy From Waste	
	M19PS2109	Energy Management and Auditing	
INFORMATION TECHNOLOGY	M19IT2108	Web Technologies	**ST, CS, PSA & CAD/CAM**
	M19IT2109	Internet of Things	
	M19IT2110	Machine Learning	
SCIENCE & HUMANITIES	M19BS2101	Management and Organisational Behaviour	**ST, CST, CS, PSA, IT & CAD/CAM**

SYLLABUS: MOOCS-II (M19CAD2105)

Students Going for Industrial Project/ Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a 12weeks'course duration in PG level with 3 credits, but the Chosen subject should not be covered in their M.Tech Course

SYLLABUS: DISSERTATION-I/INDUSTRIAL PROJECT (M19ST2106)

The Student has to register for Dissertation-I / Industrial project in III semester. Student has to submit,in consultation with his project supervisor, the title, objective and plan of action of his project work for approval. The student can initiate the Project work, only after obtaining the approval from the Project Review Committee(PRC).

ContinuousassessmentofDissertation-IduringtheIII-SemesterwillbemonitoredbythePRC.Dissertation-I/ IndustrialProjectisevaluatedfor50internalmarksand50 external marks.

Internal marks 50 awarded by Project Guide and PRC jointly based on continuous assessment consisting of two seminars based on Dissertationwork-I.

External marks 50 awarded by External Examiner, Supervisor and Head of the Department jointly based On a review and Viva voce on Dissertation work-I.

Regulation: R19						**II / IV - B.Tech. II - Semester**			
MECHANICAL ENGINEERING (CAD/CAM) **(Under Choice Based Credit System / Elective Course System)**									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2019-20 admitted Batch onwards)									
Course Code	**Course Name**	**Category**	**Cr.**	**L**	**T**	**P**	**Int. Marks**	**Ext. Marks**	**Total Marks**
M19CAD2 201	Dissertation-II /Industrial Project	PR	16	0	0	32	--	100	100

CAD/CAM
SYLLABUS : DISSERTATION-II/INDUSTRIALPROJECT (M19ST2201)

The student has to continue his/her work from Dissertation-I / Industrial project to complete Dissertation-II in IV semester.

Continuous assessment of Dissertation-II during IV-Semester will be monitored by the PRC.

Dissertation-II is evaluated for 100 external marks based on Review and Viva Voce.

Review and Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the Thesis. The Board shall jointly report the candidate's work for 100 marks.

If the report of the Viva-Voce is unsatisfactory (ie, < 50 marks), the candidate shall retake the Viva-Voce examination only after three months. If he fails to get a satisfactory report at the second Viva-Voce examination, the candidate has to reregister for the project and complete the project within the stipulated time after taking the approval from the College.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JNTUK, Kakinada),(Recognized by AICTE, NewDelhi) Accredited by NAAC with'A'Grade
UG Programmes CE, CSE, ECE, EEE, IT & ME are Accredited by NBA
ChinnaAmiram, Bhimavaram-534204. (AP)

Estd:1980

LIST OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS TO THE III Semester M.TECH. STUDENTS

S.No	Offered from	Course Code	Course Name	Offered to
1	CIVIL ENGINEERING	M19 ST 2107	Construction Management	**CST, CS, PSA,IT & CAD/CAM**
2		M19 ST 2108	Green Technology	
3		M19 ST 2109	Analysis of Offshore Structures	
4	COMPUTER SCIENCE & ENGINEERING	M19 CST 2106	Python Programming	**ST, CS, PSA & CAD/CAM**
5		M19 CST 2107	Artificial Intelligence	
6		M19 CST 2108	Advanced Data structures	
7	ELECTRONICS & COMMUNICATIONENGINEERING	M19 CS 2107	Signals and systems	**ST, CST, PSA, IT & CAD/CAM**
8		M19 CS 2108	Principles of Communication	
9		M19 CS 2109	Image and video Processing	
10	ELECTRICAL & ELECTRONICS ENGINEERING	M19PS2107	Electric And Hybrid Vehicles	**ST, CST, CS, IT & CAD/CAM**
11		M19PS2108	Energy From Waste	
12		M19PS2109	Energy Management and Auditing	
13	INFORMATION TECHNOLOGY	M19IT2108	Web Technologies	**ST, CS, PSA & CAD/CAM**
14		M19IT2109	Internet of Things	
15		M19IT2110	Machine Learning	
16	MECHNAICAL ENGINEERING	M19CAD 2107	Operations Research	**ST, CST, CS,PSA & IT**
17		M19CAD 2108	Nano Technology	
18		M19CAD 2109	Product Design & Manufacturing	
19	SCIENCE & HUMANITIES	M19BS2101	Management and OrganisationalBehaviour	**ST, CST, CS, PSA, IT & CAD/CAM**