

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

Accredited by NBA, NAAC

Sheriguda(V), Ibrahimpatnam(M), R.R.Dist. – 501510



CIVIL ENGINEERING
(BR20)

PROGRAM OUTCOMES (POs)

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

COURSE OUTCOMES (COs)

Course Code	Course Name	Year / Semester	Course Outcomes
R20CIV2101	Surveying & Geomatics	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Apply the knowledge to calculate angles, distances and levels • Identify data collection methods and prepare field notes • Understand the working principles of survey instruments, measurement errors and corrective measures • Interpret survey data and compute areas and volumes, levels by different type of equipment and relate the knowledge to the modern equipment and methodologies • Electronic distance measuring equipment, total stations, theodolites, compasses, remote sensing equipment, GPS base and rover receivers, data collectors and hand-help programmable calculators. • Practice in the establishment of monuments, corners, lines and witness points in accordance with available data. Practice in the preparation of land boundary descriptions and survey plats.
R20MED2105	Hydraulics and Hydraulic Machinery	II YEAR I SEMESTER	<ul style="list-style-type: none"> • apply their knowledge of fluid mechanics in addressing problems in open channels and hydraulic machinery. • Understand and solve problems in uniform, gradually and rapidly varied flows in open channel in steady state conditions. • apply dimensional analysis and to differentiate the model, prototype and similitude conditions for practical problems. • Get the knowledge on different

			<p>hydraulic machinery devices and its principles that will be utilized in hydropower development and for other practical usages</p> <ul style="list-style-type: none"> • To provide the students with a solid foundation in fluid flow principles • To provide the students knowledge in calculating performance analysis in turbines and pumps and can be used in power plants
R20CIV2102	Strength of Materials-I	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Determine stresses in the member subjected to Torsion • Analyze columns and struts • Understand the concept of direct and bending stresses • Analyze and design springs, thin and thick cylinders • Understand the concept of unsymmetrical bending. • To understand the basics of material properties, stress and strain.
R20MTH2101	Probability Distributions and Statistical Methods	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Apply the concepts of probability and distributions to some case studies • Correlate the material of one unit to the material in other units • Resolve the potential misconceptions and hazards in each topic of study. • Estimate the quantity of the items required to complete the project. • Determine the line of best fit in any regression analysis using Least Square Method. • Apply the Statistical Hypothesis Testing to determine whether an experiment conducted provides enough evidence to reject a proposition.

R20MED2106	Fluid Mechanics	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Apply conservation laws to derive governing equations of fluid flows. • Compute hydrostatic and hydrodynamic forces. • Analyze and design simple pipe systems. • Apply principles of dimensional analysis to design experiments. • Compute drag and lift coefficients. • Student will be able to apply Bernouli principle and compute pressure drop in flow systems of different configurations
R20CIV21L1	Surveying Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Appreciate the need for accurate and thorough note taking in field work to serve as a legal record • Gain the ability to use modern survey equipment to measure angles and distances • Gain a basic understanding of the principles and operation of the Global Positioning System • Gain the ability to measure differences in elevation, draw and utilize contour plots, and calculate volumes for earthwork • Improve ability to function as a member of a survey party in completing the assigned field work • Appreciate the need for licensed surveyors to establish positioning information for property and structures.
R20CIV21L2	Strength of Materials Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Conduct tension test on Materials like steel etc. • Conduct compression tests on spring, wood and concrete • Conduct flexural and torsion test to determine elastic constants • Determine hardness of metals • An ability to design a system, component, or process to meet desired needs such as

			<p>economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability</p> <ul style="list-style-type: none"> • An ability to use the techniques, skills and modern engineering tools necessary for engineering practice
R20MED21L4	Hydraulics & Hydraulic Machinery Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Compute drag coefficients • Test the performance of pumps and turbines • Determine Manning's and Chezy's coefficients for smooth and rough channels • Determine Energy loss in Hydraulic jump and Calibrate standing wave flume • Develop understanding about fluid action in open channel flow • Ability to select hydraulic turbines for hydropower plants • Identify the application of fluid in open channel flow and hydraulic machines
R20MAC2100	Gender Sensitization Lab (An Activity-based Course)	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Students will have developed a better understanding of important issues related to gender in contemporary India. • Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film. • Students will attain a finer grasp of how gender discrimination works in our society and how to counter it. • Students will acquire insight into the gendered division of labour and its relation to politics

			<p>and economics.</p> <ul style="list-style-type: none"> • Men and women students and professionals will be better equipped to work and live together as equals. • Students will develop a sense of appreciation of women in all walks of life. • Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.
R20EEE2204	Basics of Electrical & Electronics Engineering	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Knowledge on basic electrical circuits, parameters, Solution of resistive circuits with independent sources and different types of instruments. • To explain the working principle, construction, applications of DC machines. • Highlight the importance of transformers in transmission and distribution of electric power. • To Gain the knowledge on working principle, construction ,applications of AC machines • Operation of diodes, transistors, realization of various electronic circuits with the various semiconductor devices. • Cathode ray oscilloscope, with which he/she can able to apply the above conceptual things to real world electrical and electronics problems and applications.
R20CIV2201	Building Materials, Construction and Planning	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Predict the properties of building stones and its classifications. Understand the concept of various methods of manufacture of bricks. Identify rock using basic geological classification systems.

			<ul style="list-style-type: none"> • Obtain differentiate the fine aggregates and coarse aggregates under various views. Explain various types of cements and their applications in construction. Various field and laboratory tests on cement. • Analyze the importance of mineral and chemical admixtures, requirements of the concrete in construction. • Explain different types of lintel, arches and the materials which are commonly used for construction. • Explain the suitability of floors in buildings like mosaic flooring, terrazzo flooring, rubber flooring, asphalt flooring. • Understand the different types of trusses, RCC roofs, and madras terrace/shell roofs.
R20CIV2202	Strength of Materials-II	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Analyze columns and struts • Understand the concept of direct and bending stresses • Analyze and design springs, thin and thick cylinders • Understand the concept of unsymmetrical bending. • Recognize physical phenomenon in the context of strength of materials. Demonstrate an understanding of the structural mechanics theory for deformable bodies • Apply structural mechanics of deformable bodies to solve engineering problems Demonstrate an understanding of the relationships between loads, member forces and deformations and material stresses and strains • Demonstrate an understanding of the assumptions and limitations of the structural mechanics theory Competence in problem

			identification, formulation and solution
R20CIV2203	Structural Analysis -I	II YEAR II SEMESTER	<ul style="list-style-type: none"> Analyze Perfect , Imperfect And Redundant Frames Formulate Equilibrium and compatibility equations for structural members Analyze one dimensional and two dimensional problems using classical methods Analyze indeterminate structures Analyze structures for gravity loads, moving loads and lateral loads Evaluate and draw the influence lines for reactions, shears, and bending moments in beams and girders due to moving loads.
R20CIV2204	Engineering Geology	II YEAR II SEMESTER	<ul style="list-style-type: none"> Understand weathering process and mass movement Distinguish geological formations Identify geological structures and processes for rock mass quality Identify subsurface information and groundwater potential sites through geophysical investigations Apply geological principles for mitigation of natural hazards and select sites for dams and tunnels To understand issues concerning the geological basement and structure of a region. To describe and interpret the geological structures in the geological maps and cross sections.
R20CIV22L1	Computer aided Civil Engineering Drawing	II YEAR II SEMESTER	<ul style="list-style-type: none"> Use the Autocad commands for drawing 2D & 3D building drawings required for different civil engg applications. Plan and draw Civil Engineering Buildings as per aspect and orientation. Presenting drawings as per user requirements and preparation of

			<p>technical report</p> <ul style="list-style-type: none"> • Introduction to computer aided drafting, Software for CAD – Introduction to different softwares, Practice exercises on CAD software • Drawing of plans of buildings using software a) Single storied buildings b) multi storied buildings • Developing sections and elevations for a) Single storied buildings b) multi storied buildings • Detailing of building components like Doors, Windows, Roof Trusses etc. using CAD softwares. Exercises on development of working drawings of buildings
R20CIV22L2	Engineering Geology lab	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Position to read, understand and interpret different maps like Toposheet, Structural Geology maps, Stratigraphic maps, geological cross-sections, Isopach maps, Structural Contour maps etc. • Understand how to locate own / outcrop positions on Toposheet and how to take traverse • Understand geological formations and measure dip and strike reading correctly in the field • Calculate true dip, true thickness, Oil Water Contact (OWC) from given maps • Explain different sediment depositional environments from stratigraphic columns • Ability to categorize rocks and minerals by their origin and engineering properties.
R20EEE22L3	Electrical & Electronics Lab	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Experimentally verify the basic circuit theorems. • Measure power and power factor in ac circuits. • Learn the characteristics of different type machines. • Understand the operation and applications of electromechanical energy conversion devices.

			<ul style="list-style-type: none"> • Understand identification and selection of various electrical and electronic components. • Analyze the characteristics of various electronics components.
R20MAC2200	Intellectual Property Rights	II YEAR II SEMESTER	
R20CIV3101	Structural Analysis-II	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Analyze Perfect , Imperfect And Redundant Frames • Formulate Equilibrium and compatibility equations for structural members • Analyze one dimensional and two dimensional problems using classical methods • Analyze indeterminate structures • Analyze structures for gravity loads, moving loads and lateral loads • Students will learn Analysis of structures.
R20CIV3102	Geotechnical Engineering	III YEAR I SEMESTER	<ul style="list-style-type: none"> • The student must know the definition of the various quantities related to soil mechanics and establish their inter-relationships. • The student should be able to know the methods of determination of the various index properties of the soils and classify the soils. • The student should be able to know the importance of the different engineering properties of the soil such as compaction, permeability, consolidation and shear strength and determine them in the laboratory. • The student should be able to apply the above concepts in day-to-day civil engineering practice. • Understand the origin of the soil and geological cycle. • Apply principles of phase diagram for soil properties and perform basic weight-volume calculations.

R20CIV3103	Structural Engineering – I(RCC)	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Design RC Structural elements • Design the Reinforced Concrete beams using limit state Design • Design Reinforced Concrete slabs • Design the Reinforced Concrete Columns and footings • Design structures for serviceability • Design staircases, canopy • Outcomes After the completion of the course student should be able to • Compare and Design the singly reinforced, doubly reinforced and flanged sections. • Design the axially loaded, uniaxial and biaxial bending columns. • Classify the footings and Design the isolated square, rectangular and circular footings • Distinguish and Design the one-way and two-way slabs.
R20CIV3104	Transportation Engineering-I	III YEAR I SEMESTER	<ul style="list-style-type: none"> • An ability to apply the knowledge of mathematics, science and engineering in the areas of traffic engineering, highway development and maintenance • An ability to design, conduct experiments to assess the suitability of the highway materials like soil, bitumen, aggregates and a variety of bituminous mixtures. Also the students will develop the ability to interpret the results and assess the suitability of these materials for construction of highways. • An ability to design flexible and rigid highway pavements for varying traffic compositions as well as soil subgrade and environmental conditions using the standards stipulated by

			<p>Indian Roads Congress.</p> <ul style="list-style-type: none"> • An ability to evaluate the structural and functional conditions of in-service highway pavements and provide solution in the form of routine maintenance measures or designed overlays using Indian Roads congress guidelines. • An ability to assess the issues related to road traffic and provide engineering solutions supported with an understanding of road user psychological and behavioural patterns. • Understand the factors influencing road vehicle performance characteristics and design.
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Professional Elective-I

R20CIV3111	Concrete Technology	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Determine the properties of concrete ingredients i.e. cement, sand, coarse aggregate by conducting different tests. Recognize the effects of the rheology and early age properties of concrete on its long-term behavior. • Apply the use of various chemical admixtures and mineral additives to design cement based materials with tailor-made properties • Use advanced laboratory techniques to characterize cement-based materials. • Perform mix design and engineering properties of special concretes such as high performance concrete, self-compacting concrete, and fibre reinforced concrete. • The course is the basis for the use of concrete, with emphasis on requirements and possibilities within the standard for consultants, concrete producers, contractors and owners. • Proportioning of concrete including principles for self-compacting concrete taking into account fresh (rheology, stability) and hardened concrete (strength,
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			durability, economy, sustainable development).
R20MBA3112	Management Fundamentals for Engineers	III YEAR I SEMESTER	The students understand the significance of Management in their Profession. The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course. The students can explore the Management Practices in their domain area.
R20CIV3113	Basics of Mechanical Engineering	III YEAR I SEMESTER	<ul style="list-style-type: none"> • The ability to analyze and model physical systems or components using (apply knowledge of) mathematics (including multivariable calculus and differential equations), basic science and engineering. • The ability to design and conduct experiments, as well as to analyze and interpret data. • The ability to design and realize a physical system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. • The ability to function on multidisciplinary teams. • The ability to identify, formulate, and solve engineering problems. • The understanding of professional and ethical responsibility. The ability to communicate effectively.
R20CIV31L1	Highway Engineering and Concrete Technology Lab	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Perform different tests conducted on cement, aggregate and concrete at site. • Perform non-destructive test on concrete. • Design the concrete mix as per the site conditions and specification of materials available there. • Assess the different properties of aggregate • Summarise the concept of

			<p>workability and testing of concrete</p> <ul style="list-style-type: none"> • Describe the preparation of green concrete. Describe the properties of hardened concrete
R20CIV31L2	Geotechnical Engineering Lab	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Carry out soil mechanics fundamental experiments according to IS standards • Collect, analyze and interpret experimental data • Design soil mechanics experiments and determine which test is needed in designing civil engineering projects • Use communication skills to transfer their findings in a formal report format
R20HAS31L1	Advanced Communication Skills Lab	III YEAR I SEMESTER	<p>Communicate efficiently in the work place up professional context</p> <ul style="list-style-type: none"> • Accomplishment of sound vocabulary and its proper use contextually. • Flair in Writing and felicity in written expression. • Enhanced job prospects. • Effective Speaking Abilities
R20CSE3124	Cyber Security	III YEAR I SEMESTER	<p>The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context</p>
R20CIV3201	Hydrology & Water Resources Engineering	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand the different concepts and terms used in engineering hydrology • To identify and explain various formulae used in estimation of surface and Ground water hydrology components • Demonstrate their knowledge to connect hydrology to the field requirement • The basic requirements of irrigation and various irrigation techniques, requirements of the crops • Distribution systems for canal irrigation and the basics of design of unlined and lined irrigation canals design

			<ul style="list-style-type: none"> • Basic components of river Training works. Various components of hydrologic cycle that affect the movement of water in the earth
R20CIV3202	Environmental Engineering	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Assess characteristics of water and wastewater and their impacts • Estimate quantities of water and waste water and plan conveyance components • Design components of water and waste water treatment plants • Be conversant with issues of air pollution and control • Air quality, emissions and pollution control and Environmental health. • Water and wastewater quality and treatment ,Hazardous and solid waste engineering
R20MBA3201	Engineering Economics & Accounting	III YEAR II SEMESTER	Student will able to solve various business problem up make various business decision
R20CIV3203	Structural Engineering – II(Steel)	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Analyze the tension members, compression members. • Design the tension members, compression members and column bases and joints and connections • Analyze and Design the beams including built-up sections and beam and connections. • Identify and Design the various components of welded plate girder including stiffeners • Students are able to design the connection of steel structure and students are able to design the tension and compression members • Students are able to design the beam and roof truss in steel structure and Students able to design the plate and gantry design
Professional Elective –II			
R20CIV3221	Prestressed Concrete	III YEAR II	<ul style="list-style-type: none"> • Acquire the knowledge of evolution of process of prestressing.

	Structures	SEMESTER	<ul style="list-style-type: none"> • Acquire the knowledge of various prestressing techniques. • Develop skills in analysis design of prestressed structural elements as per the IS codal provisions • To design prestressed concrete beam and also design prestressed composite beams • To design flexural members with partial prestressing and also design prestressed concrete tanks, poles and sleepers • To design prestressed concrete bridges
R20CIV3222	Elements of Earth Quake Engineering	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand and apply the basics of structural dynamics in analysis of structures subjected to earthquakes. • Understand plate tectonics. • Understand ground motion magnitude, intensity, and frequency. • Understand and compute ground motion intensity measures and attenuation relationships. • Understand and compute earthquake hazard and design response spectra. • Understand and apply building code earthquake requirements in design of structural systems.
R20CIV3223	Finite Element Methods	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand the concepts behind variational methods and weighted residual methods in FEM. • Identify the application and characteristics of FEA elements such as bars, beams, plane and isoparametric elements, and 3-D element. • Develop element characteristic equation procedure and generation of global stiffness equation will be applied. • Able to apply Suitable boundary conditions to a global structural equation, and reduce it to a solvable form. • Able to identify how the finite element method expands beyond

			<p>the structural domain, for problems involving dynamics, heat transfer, and fluid flow.</p> <ul style="list-style-type: none"> • Identify the application and characteristics of FEA elements such as bars, beams, plane and isoparametric elements, and 3-D element.
R20CIV32L1	Environmental Engineering Lab	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand about the equipment used to conduct the test procedures • Perform the experiments in the lab • Examine and Estimate water, waste water, air and soil Quality • Compare the water, air quality standards with prescribed standards set by the local governments • Develop a report on the quality aspect of the environment • Perform common environmental experiments relating to water and wastewater quality, and know which tests are appropriate for given environmental problems.
R20CIV32L2	Computer Aided Design Lab	III YEAR II SEMESTER	<ul style="list-style-type: none"> • After the completion of the course student should be able to • Model the geometry of real world structure Represent the physical model of structural element/structure • Perform analysis • Interpret from the Post processing results • Design the structural elements and a system as per IS Codes • Apply basic concepts to develop construction (drawing) techniques and Ability to manipulate drawings through editing and plotting techniques
R20CIV4101	Estimation, Costing and Project Management	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure. • Quantify the worth of a structure by evaluating quantities of

			<p>constituents, derive their cost rates and build up the overall cost of the structure.</p> <ul style="list-style-type: none"> • Understand how competitive bidding works and how to submit a competitive bid proposal. • An idea of how to optimize construction projects based on costs • An idea how construction projects are administered with respect to contract structures and issues. • An ability to put forward ideas and understandings to others with effective communication processes
R20CIV4102	Transportation Engineering-II	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • An ability to apply the knowledge of mathematics, science and engineering in the areas of traffic engineering, highway development and maintenance • An ability to design, conduct experiments to assess the suitability of the highway materials like soil, bitumen, aggregates and a variety of bituminous mixtures. Also the students will develop the ability to interpret the results and assess the suitability of these materials for construction of highways. • An ability to design flexible and rigid highway pavements for varying traffic compositions as well as soil sub grade and environmental conditions using the standards stipulated by Indian Roads Congress. • An ability to evaluate the structural and functional conditions of in-service highway pavements and provide solution in the form of routine maintenance measures order signed overlays using Indian Roads congress guidelines. • An ability to assess the issues related to road traffic and provide engineering solutions supported with an understanding of road user psychological and

			<p>behavioural patterns.</p> <ul style="list-style-type: none"> • Differentiate the working of various transport systems and their working in different scenarios
Professional Elective –III			
R20CIV4131	Remote Sensing &GIS	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Describe different concepts and terms used in Remote Sensing and its data • Understand the Data conversion and Process in different coordinate systems of GIS interface • Evaluate the accuracy of Data and implementing a GIS • Understand the applicability of RS and GIS for various applications. • Understand the basic concept of GIS and its applications; know different types of data representation in GIS. • Understand and Develop models for GIS spatial Analysis and will be able to know what the questions that GIS can answer.
R20CIV4132	Ground Improvement Techniques	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Know the necessity of ground improvement • Understand the various ground improvement techniques available • Select & design suitable ground improvement technique for existing soil conditions in the field • Understand the different ground improvement techniques • Understand the methods of stabilization • Understand the methods and properties of reinforced soil
R20CIV4133	Advance Structural Analysis	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Demonstrate the concepts of qualitative influence line diagram for continuous beams and frames. • Apply the methods of indeterminate truss analysis • Demonstrate the behavior of arches and their methods of analysis analyze cable suspension bridges • Analyze multi story frames subjected to gravity loads and

			<p>lateral loads</p> <ul style="list-style-type: none"> • Ability to analyze statically determinate trusses, beams, and frames and obtain internal loading • Ability to analyze cable and arch structures. Ability to determine deflections of beams and frames using classical methods
R20CIV4141	Irrigation and Hydraulic Structures	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand the design aspects of various hydraulic structures on permeable foundation and their causes of failure. • Plan and design the efficient silt control structures and relevant river training works. • Plan and design suitable transition structures for subcritical and supercritical flow conditions using standard available methods. • Plan and design of canal regulation works. • Able to classify the canal and tub well irrigation and applicability of various theories on it. • Able to understand various techniques and parameters of irrigation.
R20CIV4142	Theory of Elasticity	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Problems of the application basic science systematization thought excavation, the evaluation, the diagnosis project question, and plans and carries out ability of the special study and the solution. • Have independent research, collection the data, standard problem take into analytical the identification acquire conclusion, and have development innovation and compose the ability of professional thesis. • Usage mathematics engineering realm is related analysis and design software, explanation data with independently solve the ability of problem. • Effectively communicate, expression integrity, leadership management, team cooperation division of labor and moderate integration of ability.

			<ul style="list-style-type: none"> • Has mathematical and the project professional field self-study, the innovation ponder and ability of the sustained development. • Have international machine and aviation of control to develop trend and technique ability
R20CIV4143	Ground water Hydrology	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Various components of hydrologic cycle that affect the movement of water in the earth • Various Stream flow measurements technique • the concepts of movement of ground water beneath the earth • the basic requirements of irrigation and various irrigation techniques, requirements of the crops • Distribution systems for canal irrigation and the basics of design of unlined and lined irrigation canals design • Basic components of river Training works. • Apply math, science, and technology in the field of water resource Engineering
Professional Elective –V			
R20CIV4251	Foundation Engineering	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand the principles and methods of Geotechnical Exploration • Decide the suitability of soils and check the stability of slopes • Calculate lateral earth pressures and check the stability of retaining walls • Analyse and design the shallow and deep foundations • The study of Foundation engineering .subject develops the knowledge & confidence level of the students to select the proper type of foundation & its safe & economic design • To introduce purposes, extent and methods of soil exploration. To understand analysis of lateral earth pressure for design of earth retaining structures

R20CIV4252	Environmental Impact Assessment	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand the different steps within environmental impact assessment • Discuss the implications of current jurisdictional and institutional arrangements in relation to environmental impact assessment • Communicate both orally and in written form the key aspects of environmental impact assessment • Understand how to liaise with and the importance of stakeholders in the EIA process • Be able to access different case studies/examples of EIA in practice • To provide students with the knowledge and professional skills necessary to enable them to undertake environmental impact assessment.
R20CIV4253	Air pollution	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • to understand basic aspects on air pollution and the quality of atmospheric environment • to describe and clearly understand the sources causing the air pollution • to clearly understand, interpret and explain aspects regarding the air pollution and also to estimate, assess and come to conclusions • to perform statistical analysis of pollutant concentration and compare to limit values • to evaluate different types of air pollution and the means of abatement control • to carry out write-ups and reports based on measurements
Professional Elective –VI			
R20CIV4261	Airports, railways and water ways	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Explain the working of various design elements used in different Transport systems • Calculate entities like maximum permissible loads on rails ,degree of curves, permissible speeds on various gauges etc

			<ul style="list-style-type: none"> • Prepare master plans for Airports, harbour site considering natural phenomenon and different harbour railway airport elements • Exposure to new technologies which are currently in use for safe and efficient travel • Predict the upcoming trends and changes which are likely to take place in transport and travel modes. • Introduce the recent advancements in the field of Sustainable Urban Development, Traffic Engineering and Management, Systems Dynamics Approach to Transport Planning
R20CIV4262	Intelligent Transportation Systems	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Differentiate different ITS user services • Select appropriate ITS technology depending upon site specific conditions. • Design and implement ITS components • Assess the range of options available for the management of freeway and arterial traffic • Investigate and analyse the current applications and trends in the context of AVCS • Research the contemporary issues in the application of advanced technology in transport
R20CIV4263	Urban Transportation Planning	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Identify urban transportation problems. • Estimate urban travel demand. • Plan urban transport networks. • Identify urban transport corridors. • Prepare urban transportation plans • Apply the fundamentals of traffic flow theory in the management and operations of road traffic

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ENGINEERING
(BR20)**

PROGRAM OUTCOMES (POs)

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

COURSE OUTCOMES (COs)

Course Code	Course Name	Year / Semester	Course Outcomes
R20MED2203	Fluid Mechanics & Hydraulic Machines	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Generate mathematical models of fluid motion including steady and unsteady flow. • Recite fluid properties and fluid statics. • State and visualize fluid kinematics. • Predict and design a fluid dynamical system based on inviscid theory. • Model compressible flow systems. • Design of hydraulic Impulse, Francis, Kaplan turbines and design of centrifugal and <ul style="list-style-type: none"> ○ reciprocating pumps and their specifications , working principles and their characteristics • To understand boundary layer concepts, types of losses in pipes and measurement of flow. • Able to understand basics of turbo machines, pelton wheel, francis turbine and Kaplan turbine. • Centrifugal and Reciprocating pumps.
R20EEE2101	Electrical Circuit Analysis	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Apply the basics of circuit analysis • To understand the concept of elements, input signals, circuit laws , reduction techniques and star to delta transformation • Knowledge in analysis of AC circuits for all combinations ,concept of phasor and power analysis. • To know the basics of magnetic circuits, resonance in series and parallel circuits. • Knowledge about the concepts of graph theory, analysis of networks using topology • To solve electrical networks of both AC and DC by applying theorems.
R20ECE2105	Analog Electronics	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Describe the construction, operation and characteristics of electronic devices like P-N- Junction and special Purpose diodes. • Determine the application of diode as a

			<p>rectifier</p> <ul style="list-style-type: none"> • Illustrate the application of transistors as amplifier employing BJT devices • Analyse the Biasing circuits using BJT Transistor Amplifier Circuit • Evaluate construction, operation and characteristics of FET • Select Biasing circuits using FET Amplifiers
R20EEE2102	Electrical Machines-I	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand electrical principle, laws, and working of DC machines. • Analyze the construction and different types of windings of DC generator. • Analyze the Characteristics and application of various types of DC generators. • Analyze the construction and characteristics and application of various types of DC motors. • Understand the different types of speed control motors and its characteristics. • Analyze the different types of losses and testing of motors according to Indian standards.
R20EEE2103	Electro Magnetic Fields	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Should be able to specify the “constitutive relationships” for fields and understand why they are required. • Apply vector calculus to static electric-magnetic fields in different engineering situations. • Analyze Maxwell’s equation in different forms (differential and integral) and apply them to diverse engineering problems. • Examine the phenomena of wave propagation in different media and its interfaces and in applications of microwave engineering. • Analyze the nature of electromagnetic wave propagation in guided medium which are used in microwave applications. • Experimental measurement of voltages induced by time varying magnetic flux. Flux determination.
R20EEE21L1	Electrical	II YEAR I	<ul style="list-style-type: none"> • Have knowledge of various parts of a

	Machines Lab-I	SEMESTER	<p>electrical machine.</p> <ul style="list-style-type: none"> • Develop knowledge helpful for application of dc machines. • Ability to conduct speed control of different types of DC Motors. • Ability to test for characteristics of various generators depending on their type of field excitation. • Ability to understand the concept of different types of windings viz lap and wave for armature. • Ability to perform test on Motor-Generator Set. • To know the concept of commutation dc machines for conversion of Ac to Dc or Dc to Ac.
R20ECE21L4	Analog Electronics Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Determine the P-N-Junction diode & Zener diode characteristics. • Calculate the Input and Output characteristics of BJT and FET. • Evaluate Half Wave and Full Wave Rectifier with and without filters. • Differentiate Measurement of h-parameters of transistor in CB, CE, CC configurations. • Analyse the Frequency response of CE, CC and Common Source FET Amplifier. • Measure SCR and UJT characteristics.
R20EEE21L2	Electrical Circuits Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand the concept of Theorems. • Solve AC And DC Circuits. • Understand the concept of Resonance. • Express given Electrical Circuit in terms of A,B,C,D and Z,Y Parameter Model and solve the circuits. • To analyze and calculate the coefficient of coupling. • Measure three phase voltages and currents, active, reactive powers
R20MAC2100	Gender Sensitization Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Students will have developed a better understanding of important issues related to gender in contemporary India. • Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be

			<p>achieved through discussion of materials derived from research, facts, everyday life, literature and film.</p> <ul style="list-style-type: none"> • Students will attain a finer grasp of how gender discrimination works in our society and how to counter it. • Students will acquire insight into the gendered division of labour and its relation to politics and economics. • Men and women students and professionals will be better equipped to work and live together as equals. • Students will develop a sense of appreciation of women in all walks of life. • Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.
R20MTH2201	Laplace Transforms , Numerical Methods & Complex variables	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Use the Laplace transforms techniques for solving ODE's • Find the root of a given equation. • Estimate the value for the given data using interpolation • Find the numerical solutions for a given ODE's • Analyse the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems • Taylor's and Laurent's series expansions of complex function
R20EEE2201	Electrical Machines – II	II YEAR II SEMESTER	<ul style="list-style-type: none"> • To understand the application of Faraday's law to transformers with application to an equivalent circuit for a practical transformer. • Able to study of single phase transformer operation, construction and performance characteristics. • To clearly understand the testing and maintenance of transformers. • To analyze the basic concepts of Auto and poly phase transformers and their performance characteristics • To Understand the concept of poly phase induction motors construction and its characteristics. • To understand the torque speed

			characteristics of an induction motor with application to the equivalent circuit of a induction motor.
R20ECE2102	Digital Logic Design	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Interpret the various number systems & code converters, error detecting and correcting, BCD, Gray Code, EX-3. • Describe the operation of logic gates and Apply Boolean Algebra on K-map. • Design / Analysis of Combinational Circuits. • Diagram illustrates the operation & timing constrains for Latches & Flip-Flops and Registers and Counters. • Design & analyze sequential circuits. • Use HDL & appropriate EDA tools for digital logic design & simulation.
R20EEE2202	Control Systems	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Express the basic elements and structures of feedback control systems. • Represent the mathematical model of a system. • Apply Routh-Hurwitz criterion, RootLocus, Bode Plot and Nyquist Plot to determine the domain of stability of linear time-invariant system. • Determine the steady-state response, errors of stable control systems and design compensators to achieve the desired performance. • Analyse the stability of the system. • Design lead, lag, lead-lag compensators. • Express control system models on state space models, to express state transition matrix and calculation of variables.
R20EEE2203	Power System-I	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand power plants, • To Analyze A.C and D.C distribution networks for necessary variable calculation. • To understand the operation AIR insulated and GAS insulated indoor / outdoor substations. • Able to Control the voltage and power factor by using shunt, series and synchronous capacitor.

			<ul style="list-style-type: none"> • Construct the power /Energy demand in the form of graph • To understand the Economic aspects of power generation and deferent types of TARIFF methods with which he/she can able to apply the above conceptual things to real – world electrical and electronics powers and applications.
R20ECE21L2	Digital Logic Design Lab	II YEAR II SEMESTER	<ol style="list-style-type: none"> 1. Explain theory of Boolean Algebra & the Underlying features of various number systems. 2. Use the concepts of Boolean Algebra for the analysis & design of various combinational logic circuits. 3. Use the concepts of Boolean Algebra for the analysis & design of various sequential logic circuits. 4. Design various logic gates starting from simple ordinary gates to complex Programmable logic devices & arrays. 5. Analyze the various coding schemes are the part of the digital circuit design. Design of various circuits with the help of VHDL coding techniques.
R20EEE22L1	Electrical Machines Lab-II	II YEAR II SEMESTER	<ul style="list-style-type: none"> • To Understanding principles of AC machines. • Find role of electrical machinery pertaining to Synchronous machines, Single phase motors in simple applications. • Articulate rotating magnetic generation • Calculate machine variables in direct and quadrature axis form • Express working of single and three phase AC Machines • Know the concept of harmonics created in supply systems, need for reduction and design of Synchronous machines for reducing them.
R20EEE22L2	Control Systems Lab	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Find time response of given control system model. • To understand the characteristics of synchros. • Study and verification of truth tables of logic gates, simple Boolean expression and application of speed

			<p>control of motor.</p> <ul style="list-style-type: none"> • To analyze the feedback of servo motor. • Formulate transfer function for given control system problems. • Design PID controllers for given control system model • Design Lead, Lag, Lead-Lag systems in control systems. • To understand characteristics of magnetic amplifier.
R20MAC2200	Intellectual Property Rights	II YEAR II SEMESTER	
R20EEE3101	Power Electronics	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Discuss the basics of power electronic devices. • Knowledge on construction operation V-I characteristics commutation firing and protection of various power semiconductor devices. • Discover of power electronic converters in power control applications. • Construct the Chopper circuits. • Compare characteristics of SCR, BJT, MOSFET and IGBT. • Understand the role power electronics play in the improvement of energy usage efficiency • Experiment the design of AC voltage controller and Cyclo Converter.
R20EEE3102	Power System-II	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Gain the knowledge on calculation of transmission line parameters, • To analyze Performance analysis of short medium long length transmission lines. • Design and analyse the transmission line. • To understand the factors affecting the performance analysis of transmission lines, transients in power systems. • To analyze operation of different types of overhead line insulators, sag and tension calculation of transmission lines. • To understand the analysis of underground cables for power

			transmission and distribution, with which he/she can able to apply the above conceptual things to real-world electrical and electronics problems and applications.
R20EEE3103	Measurements and Instrumentation	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand different types of measuring instruments, their construction, operation and characteristics. • Understand the Principle and operation Potentiometers & Instrument transformers. • Identify the instruments suitable for typical measurements. • Apply the suitable method for measurement of resistance, inductance and capacitance • Understand the different types of bridges. • Apply the knowledge about transducers and instrument transformers to use them effectively.
Professional Elective-I			
R20CSE3164	Computer Architecture	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Design Arithmetic And Logic Unit. • Design And Analyse Pipelined Control Units • Understand Parallel Processing Architectures. • Evaluate Performance Of Memory Systems.
R20EEE3111	High Voltage Engineering	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Gains knowledge on basics of high voltage engineering. • To identify the Break-down phenomenon in different types of dielectrics. • To analyze the generation and measurement of high voltages and currents. • To discuss the phenomenon of over-voltages system faults and other abnormal conditions • Discuss the concept of insulation coordination. • To understand testing of various materials and electrical apparatus used in high voltage engineering, with which he/she can able to apply the above

			conceptual things to real-world electrical and electronics problems and applications.
R20EEE3112	Electric Machine Design	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand the construction and performance characteristics of electrical machines. • Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines • Understand the principles of electrical machine design and carry out a basic design of an ac machine. • Use software tools to do design calculations.
R20MBA2201	Business Economics & Financial Analysis	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand the market dynamics namely, demand and supply, demand forecasting, elasticity of demand and supply, pricing methods and pricing in different market structures. • Gain an insight into how production function is carried out to achieve least cost combination of inputs and cost analysis. • Develop an understanding of • Analyse how capital budgeting decisions are carried out. • Understanding the framework for both manual and computerised accounting process • Know how to analyse and interpret the financial statements through ratio analysis.
R20EEE31L1	Power System Simulation Lab	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Construct Y-bus and Z-bus • Compare the different load flow methods • Analyze the different stability analysis of variety of power systems • Calculate reliability indices for generation distribution • Simulate basic electrical circuits <p>Simulate power electronic converters and drives</p>
R20EEE31L2	Power Electronics Lab	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Use the techniques, skills and modern engineering tools necessary for engineering practice. • To understand the characteristics of SCR, MOSFET & IGBT. • Identify, formulate & solve engineering problems.

			<ul style="list-style-type: none"> • Perform gate firing circuits. • Analyze the Rectifier, Inverter and commutation of Choppers circuits • Perform cyclo converter circuits on hardware kits. • Demonstrate working of AC voltage controller circuit on hardware kit.
R20EEE31L3	Measurements and Instrumentation Lab	III YEAR I SEMESTER	<ul style="list-style-type: none"> • To choose instruments • Test any instrument • Find the accuracy of any instrument by performing experiment • Calibrate PMMC instrument using D.C potentiometer
R20HAS31L1	Advanced Communication Skills Lab	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Accomplishment of sound vocabulary and its proper use contextually. • Flair in Writing and felicity in written expression. • Enhanced job prospects. • Effective Speaking Abilities
Professional Elective-II			
R20ECE3202	Digital signal processing	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Perform time, frequency and Z - transform analysis on signals and systems. • Understand the inter-relationship between DFT and various transforms. • Understand the significance of various filter structures and effects of roundoff errors. • Design a digital filter for a given specifications. □ Understand the fast computation of DFT and appreciate the FFT processing. • Understand the tradeoffs between normal and multi rate DSP techniques and finite length word effects.
R20EEE3221	Power Semiconductor Drives	III YEAR II SEMESTER	<ul style="list-style-type: none"> • After going through this course the student gets a thorough knowledge on, steady-state analysis • To understand the operation of control speed-torque characteristics and closed-loop operation of DC motors (separately excited shunt motor and series motor) through phase controlled rectifiers • To analyze the operation and working of choppers

			<ul style="list-style-type: none"> • To understand different types of quadratic operations such as single-quadrant two-quadrant and four- quadrant operations • To understand the concept of braking reverse-motoring reverse • To regenerative braking operations of DC motor's
R20EEE3222	Wind and Solar Energy systems	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand the energy scenario and the consequent growth of the power generation from renewable energy sources. • Understand the basic physics of wind and solar power generation. • Understand the power electronic interfaces for wind and solar generation. • Understand the issues related to the grid-integration of solar and wind energy systems.
R20ECE2103	Signals and Systems	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Represent any arbitrary signals in terms of complete sets of orthogonal functions and understands the principles of impulse functions, step function and signum function. • Express periodic signals in terms of Fourier series and express the spectrum and express the arbitrary signal (discrete) as Fourier transform to draw the spectrum. • Understands the principle of linear system, filter characteristics of a system and its bandwidth, the concepts of auto correlation and cross correlation and power Density Spectrum. • Can design a system for sampling a signal. • For a given system, response can be obtained using Laplace transform, properties and ROC of L.T. • Study the continuous and discrete signal relation and relation between F.T., L.T. & Z.T, properties, ROC of Z Transform.
R20ECE3101	Microprocessors & Microcontrollers	III YEAR II SEMESTER	<ul style="list-style-type: none"> • The student will learn the internal organization of popular 8086/8051 microprocessors/microcontrollers. • The student will learn hardware and software interaction and integration.

			<ul style="list-style-type: none"> • The students will learn the design of microprocessors / microcontrollers - based systems.
R20EEE3201	Power System Protection	III YEAR II SEMESTER	<ul style="list-style-type: none"> • The student gets a thorough knowledge on, various types of protective devices (circuit breakers, relays etc..) and their co-ordination, protection of generators, • To understand the concept of protection of transformers, by using Buchholtz relay Protection • Able to get knowledge about protection of feeders, bus-bars, through different types of protective devices • To analyze the concept of overvoltage protection and lightning • To understand the concept of earthing and grounding, with which he/she can able to apply the above conceptual things to real-world electrical and electronics problems and applications.
R20EEE3202	Power System Operation and Control	III YEAR II SEMESTER	<ul style="list-style-type: none"> • After going through this course the student gets a thorough knowledge on, economic operation of power systems, scheduling of hydro-thermal power plants, • To understand the modeling of the power system components like turbine, governor and excitation systems, necessity of keeping the frequency of the power system constant • To analyze the concept of load frequency control in single and two area systems, • To understand the operation of load frequency controllers • To get knowledge about reactive power control, uncompensated transmission line. • To understand the compensation in transmission systems through shunt and series compensations, with which he/she can able to apply the above conceptual things to real-world

			electrical and electronics problems and applications.
R20EEE32L1	Power System Lab	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Perform various load flow techniques • Understand Different protection methods • Analyze the experimental data and draw the conclusions.
R20ECE31L1	Microprocessors & Microcontrollers Lab	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Demonstrate ability to handle arithmetic operations using assembly language programming in TASM and training boards • Demonstrate ability to handle logical operations using assembly language programming in TASM • Demonstrate ability to handle string instructions using assembly language programming in TASM • Demonstrate ability to handle sorting operations and using assembly language programming in TASM
R20ECE32L4	Signals and Systems Lab	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Interpret any signal in terms of complete sets of orthogonal functions and understands the principles of basic signals • Sketch Fourier spectrum by using Fourier series and Fourier transforms. • Apply sampling theorem to reconstruct signal from its samples. • Design a distortion less LTI system and derive filter characteristics of a system. • Determine convolution, correlation in time domain and frequency domain. • Analyze Laplace Transforms, Fourier Transforms and Z-Transforms.
Professional Elective-III			
R20EEE4131	Digital Control systems	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Knowledge on basics of digital control systems, z-transforms, mapping between S-plane and Z-plane. • To analyze state-space analysis State transition matrix and its Properties. • Concept of controllability and observability, derivation of pulse-transfer function. • Stability analysis in S-domain and Z domains, stability through jury-stability test, stability through bilinear transformation

			<p>and R-H criteria.</p> <ul style="list-style-type: none"> • Design of discrete-time control systems, design of lag, lead, lead-lag compensators, and design of PID controllers. • Design of state feedback controllers and observers, with which he/she can able to apply the above conceptual things to real-world electrical and electronics problems and applications.
R20EEE4132	Optimization Techniques	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Describe clearly a problem, identify its parts and analyze the individual functions • Knowledge on Optimization of electrical and electronics engineering problems through classical optimization techniques. • To understand the linear programming, simplex algorithm. • Discuss the Transportation problem, unconstrained optimization. • To analyze the constrained non-linear programming. • Identify the Dynamic programming with which he/she can able to apply the above conceptual things to real-world electrical and electronics problems and applications.
R20EEE4133	Electrical and Hybrid Vehicles	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand the different strategies related to energy storage systems. • Understand working of different configurations of electric vehicles • Understand hybrid vehicle configuration and its components, performance analysis • Understand the properties of batteries and its types • Understand of electric vehicle drive systems • Understand of hybrid electric vehicles.
Professional Elective-IV			
R20EEE4141	HVDC Transmission	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand the importance of Transmission power through HVDC. • Analyse the HVDC Converter operation.

			<ul style="list-style-type: none"> • Discuss firing angle control of 6 pulse, 12 pulse circuits. • Discuss harmonics in HVDC. • Identify the importance of filters for HVDC system. • Analyse the impact of AC system faults on DC system operation. • Identify the need for proper grounding for HVDC operation.
R20EEE4142	Power System Reliability	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand the importance of maintaining reliability of power system components. • Apply the probabilistic methods for evaluating the reliability of generation and transmission systems. • Assess the different models of system components in reliability studies. • Analysis and Distribution System Reliability Analysis – I (Radial configuration). • Analyze the Distribution System Reliability Analysis – II (Parallel Configuration). • Understand the Effects of short-circuits - breaker operation – Open and Short-circuit failures.
R20EEE4143	Industrial Electrical Systems	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD. • Understand various components of industrial electrical systems. • Analyze and select the proper size of various electrical system components.
R20MBA4101	Fundamentals of Management for Engineers	IV YEAR I SEMESTER	The students understand the significance of Management in their Profession. The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course. The students can explore the Management Practices in their domain area.
R20EEE41L1	Electrical & Electronics Design Lab	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand the practical issues related to practical implementation of applications using electronic circuits. • Choose appropriate components,

			<p>software and hardware platforms.</p> <ul style="list-style-type: none"> • Design a Printed Circuit Board, get it made and populate/solder it with components. • Work as a team with other students to implement an application.
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Professional Elective-V

R20EEE4251	Power Quality & FACTS	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand the characteristics of ac transmission and the effect of shunt and series reactive compensation. • Understand the working principles of FACTS devices and their operating characteristics. • Understand the basic concepts of power quality. • Understand the working principles of devices to improve power quality.
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R20EEE4252	Control System Design	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand various design specifications. • Design controllers to satisfy the desired design specifications using simple controller structures (P, PI, PID, compensators). • Design controllers using the state-space approach.
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R20CSE4265	AI Techniques in Electrical Engineering	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand feed forward neural networks, feedback neural networks and learning techniques. • Understand fuzziness involved in various systems and fuzzy set theory. • Develop fuzzy logic control for applications in electrical engineering • Develop genetic algorithms for applications in electrical engineering.
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Professional Elective-VI

R20EEE4261	Smart Grid Technologies	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Analyze the structure of an electricity market in either regulated or deregulated market conditions. • Know the advantages of DC distribution and developing technologies in distribution • Discriminate the trade-offs between economics and reliability of an electric power system. • Differentiate various investment options (e.g. generation capacities, transmission, renewable, demand-side resources, etc) in electricity markets.
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			<ul style="list-style-type: none"> Analyze the developments of smart and intelligent domestic systems.
R20EEE4262	Electrical Distribution Systems	IV YEAR II SEMESTER	<ul style="list-style-type: none"> Perform load modeling and analyse the characteristics of loads . Articulate the design concepts of primary and secondary systems. Understand substation bus schemes and know the difference between 4&6 feeder patterns. Apply Knowledge of SCADA concepts for functioning of substations. Understand the coordination procedure of various protective devices. Determine the optimum capacitor location and can understand the applications of capacitors in distribution systems . Understand the importance of voltage control and know the equipment used for it.
R20EEE4263	Advanced Control of Electric Drives	IV YEAR II SEMESTER	<ul style="list-style-type: none"> To acquire the knowledge of selection of drives as per practical operational industrial requirement. To apply their knowledge to prepare control schemes as per different types of motors used in industries. To estimate & solve harmonic and power factor related problems in controlling AC and DC drives.

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

Accredited by NBA, NAAC

Sheriguda(V), Ibrahimpatnam(M), R.R.Dist. – 501510



MECHANICAL ENGINEERING
(BR20)

PROGRAM OUTCOMES (POs)

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

COURSE OUTCOMES (COs)

Course Code	Course Name	Year / Semester	Course Outcomes
R20MTH2101	Probability Distribution & Complex Variables	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand the basic terms of Probability and solve problems involving random variables. • The ability to construct and express the Probability Distributions and Density functions. • Formulate and apply statistical methods for analyzing for Testing of Hypothesis • Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems • Taylor's and Laurent's series expansions of complex function.
R20MED2101	Mechanics of Solids	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Solve the problems related to the theory of elasticity, concepts of stress and strain, strength and stiffness, deformations and displacements, strain energy, and load carrying capacity. • List different materials and structural elements to the analysis of simple structures; • Identify and formulate the structural problem and solve using a range of analytical methods. • Predict the behaviour of the solid and hollow shafts subjected to various torsion loading. • Theories of failure applied for various materials fully understood by student. • The theory of thin and thick cylinders is exposed.
R20MED2102	Material Science & Metallurgy	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Summarize significance Develop concept of crystal structure and its defects. • Metallurgy and material science and its role in manufacturing will be understood by student. • Able to know about steel making processes such as Bessemer convertor, LD Convertor and electric process. • Classify different engineering material (metals, alloys, Steels, cast irons, non-ferrous metals and alloys, tool

			<p>materials, ceramics, polymers, Semi-conductor and Composites).</p> <ul style="list-style-type: none"> • Describe phase diagram, iron – carbon diagram and heat treatment processes and TTT diagram. • Develop concept of diffusion, mechanical properties and high temperature material problems. • Select a material for a specific use based on consideration of cost and performance.
R20MED2103	Production Technology	II YEAR I SEMESTER	<ul style="list-style-type: none"> • List fundamental techniques to manufacture an engineering component. • Explain manufacture engineering components through foundry, cold and hot working, metal forming, All welding techniques, extrusion, forging. • Predict and develop a methodology and establish a manufacturing sequence to fabricate engineering components. • Judge probable routes to manufacture a particular engineering component. • Propose the most economical route to fabricate the required engineering component. • Identify and distinguish different types of advanced manufacturing technologies.
R20MED2104	Thermodynamics	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Define the basic concepts of units and dimensions, systems(open and closed systems and control volumes) and its boundaries, properties, state, process, cycle, quasi-static process etc.- required as foundation for development of principles and laws of thermodynamics • Develop Intuitive problem solving technique • Use & Practice two property rule and hence thermodynamic tables, thermodynamic diagrams and concept of equation of state, also their simple application. • Explain heat, work and first law of thermodynamics. Application of energy balance • Discuss Second law of

			<p>thermodynamics and its corollaries viz. absolute (thermodynamic) temperature scale, reversibility, entropy, feasibility of a process based on first law and second law, isentropic efficiency of adiabatic machines.</p> <ul style="list-style-type: none"> • All power cycles such as Otto, Diesel, Dual Combustion, Sterling, Atkinson, Ericsson , Lenoir Cycle will be thoroughly known to the students by going through their P–V and T-S diagrams. • Review introductory concept of power and refrigeration cycles.
R20MED21L1	Production Technology Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Apply some of the manufacturing process directly in the preparation of complicated jobs. • Make different types patterns for casting & drawing. • Use welding machine for various welding processes. • Development of plastic bottles in moulding machines. • Study of simple, compound and progressive press tool in manufacturing process. • Impart hands on practical exposure on manufacturing processes and equipment.
R20MED21L2	Machine Drawing Practice	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Describe the theory of projections and IS Conventions of drawing • Apply various concepts engineering graphics like dimensioning, conventions and standards related to machine drawings in order to become professionally efficient. • Read and interpret assembly drawings with moderate complexity. • Explain the conventions and the methods of assembly drawings. • Develop visualization skills so that they can apply these skills in developing new products. • To understand the concepts of different types valves.
R20MED21L3	Material Science & Mechanics of Solids Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Prepare the samples and identify the microstructures of Cu, Al, Iron. • Identify the differences between the

			<p>microstructures of ferrous and non-ferrous alloys.</p> <ul style="list-style-type: none"> • Conduct standard tension tests of steel & other metals. • Conduct compression and shear tests on Cement Brick & Mild steel. • Evaluate hardness and impact strength of the sample specimens. • Interpret & determine the standard mechanical properties from plots of stress versus strain.
R20MAC2100	Gender Sensitization Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Students will have developed a better understanding of important issues related to gender in contemporary India. • Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film. • Students will attain a finer grasp of how gender discrimination works in our society and how to counter it. • Students will acquire insight into the gendered division of labour and its relation to politics and economics. • Men and women students and professionals will be better equipped to work and live together as equals. • Students will develop a sense of appreciation of women in all walks of life. • Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.
R20EEE2205	Basics of Electrical & Electronics Engineering	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Explain the basic electrical DC and AC circuits. • Construction operation characteristics of DC and AC machines and also the constructional features and operation of measuring instruments like voltmeter, ammeter, wattmeter etc & different semiconductor devices.

			<ul style="list-style-type: none"> • Describe the operation of the transformers in the energy conversion process. • Summarize the operation of diodes, transistors, realization of various electronic circuits with the various semiconductor devices. • Explain the principles cathode ray oscilloscope and its applications. • Apply the above conceptual things to real world electrical and electronics problems and applications.
R20MED2201	Kinematics of Machinery	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand the fundamentals of the theory of kinematics of machines. • Understand techniques for studying motion of machines and their components. • Distinguish kinematic and kinetic motion, change link machine structure and mechanism • Identify the basic relations between distance, time, velocity, and acceleration. • Apply vector mechanics as a tool for solving kinematic problems. • Create a velocity and acceleration drawing of cam and a real-world mechanism. • Use graphical and analytic methods to study the motion of a planar mechanism. • Design of basic gear trains. • Design of basic cam systems, all types straight line mechanisms, steering mechanisms. • Design of higher pairs and hooks joints. • An ability to identify, formulate, and solve mechanical engineering problems.
R20MED2202	Thermal Engineering-I	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Classify various types of I.C. Engines and Cycles of operation. • Express the effect of various operating variables on engine performance • Discuss fuel metering and fuel supply systems for different types of engines • Distinguish normal and abnormal combustion phenomena in SI and CI engines • Justify the suitability of conventional

			<p>fuels for IC engines.</p> <ul style="list-style-type: none"> • Rotary, axial, reciprocating air compressors , their working principles, capabilities performance are known after completion of course and types of refrigeration systems and their cop calculation
R20MED2203	Fluid Mechanics & Hydraulic Machines	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Generate mathematical models of fluid motion including steady and unsteady flow. • Recite fluid properties and fluid statics. • State and visualize fluid kinematics. • Predict and design a fluid dynamical system based on inviscid theory. • Model compressible flow systems. • Design of hydraulic Impulse, Francis, Kaplan turbines and design of centrifugal and reciprocating pumps and their specifications , working principles and their characteristics • To understand boundary layer concepts, types of losses in pipes and measurement of flow. • Able to understand basics of turbo machines, pelton wheel, francis turbine and Kaplan turbine. • Centrifugal and Reciprocating pumps.
R20MED2204	Instrumentation & Control Systems	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Interpret the knowledge of field instrumentations. • Describe dynamic modeling and system behavior . • Design of controllers. • Application of control systems in processes. • Study of measurement of displacement, temperature, pressure, flow measurements, level measurements, speed, acceleration, vibration, stress and strain, humidity, force, torque and power. • Explain the types of transducers and their working principles.
R20EEE22L4	Basics of Electrical & Electronics Lab	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Explain the basic electrical DC and AC circuits. • Construction operation characteristics of DC and AC machines and also the constructional features and operation of measuring instruments like

			<p>voltmeter, ammeter, wattmeter etc & different semiconductor devices.</p> <ul style="list-style-type: none"> • Describe the operation of the transformers in the energy conversion process. • Summarize the operation of diodes, transistors, realization of various electronic circuits with the various semiconductor devices. • Explain the principles cathode ray oscilloscope and its applications. • Apply the above conceptual things to real world electrical and electronics problems and applications.
R20MED22L1	Fluid Mechanics & Hydraulic Machines Lab	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Conduct performance tests on impact of jet apparatus and determine the impact factor. • Analyze the performance curves of different turbines. • Perform the tests on pumps and calculate the efficiency of pumps. • Calibrate the coefficient of discharge of different flow meters. • Conduct the test on Bernoulli's apparatus and K5-Evaluate the Bernoulli's theorem. • Determine the friction factor for a given pipe.
R20MED22L2	Instrumentation & Control Systems Lab	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Calibrate the pressure gauge, LVDT and capacitive transducer. • Calibrate the thermocouple, RTD for temperature measurement. • Calibrate the photo and magnetic speed pickups for measurement of speed. • Calibration of Rotameter for flow measurement. • Operate seismic pickup for the measurement of vibration amplitude of an engine bed at various loads. • Calibration of Mcleod gauge for low pressure
R20MAC2200	Intellectual	II YEAR II	

	Property Rights	SEMESTER	
R20MED3101	Dynamics of Machinery	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Use of mathematical methods to analyze the forces and motion of complex systems of linkages. • Design linkage, cam and gear mechanisms for a given motion or a given input/output motion or force relationship and friction circle and friction axis. • K4-Analyze the motion and the dynamical forces acting on mechanical systems composed of linkages, gears and cams. • K4-Analyze all types of brakes, Governors, balancing of masses, Hammer blow, swaying couple, traction effort. • Study of transverse and forced vibrations, whirling of shafts and torsional vibrations. • Explain the friction occurs in various types of clutches.
R20MED3102	Design of Machine Members-I	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Students will be able to identify the elements of the design process. • Students will be able to define strict liability, negligence and express and implied warranty. • Students will be able to list the fundamental canons of engineering ethics. • Students will be able to identify or define the yield stress and the ultimate stress of a material. • Students will be able to calculate the endurance limit of a material with appropriate corrections. • Students will be able to identify the stresses acting on a surface and find principal stresses. • Students will be able to evaluate loading and stress results using principal shear stress criterion. • Students will be able to evaluate loading and stress results using maximum distortion energy criterion. • Students will be able to create a

			<p>Soderberg endurance failure line.</p> <ul style="list-style-type: none"> • Understanding all types of welded joints, keys, cotter, knuckle joints, shafts, couplings and mechanical springs.
R20MED3103	Metrology & Machine Tools	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Able to understand metal cutting principles by using all types of the cutting tools with and without the coolants. All types of the chip formations. • Apply analytical tools from a variety of their technical specifications • Perform cutting force analysis of metal cutting machines • Perform chip formation analysis of metal cutting machines • Analyse various machining processes and calculate relevant quantities such as velocities, forces, powers etc. • Identify all types of lathe machines, their operations, drilling machines, milling machines, boring machines, shaper, slotter and planer and their cutting operations and kinematic schemes. • Have a basic knowledge of safe workshop practice and the environmental implications of machining process decisions • Understand the limitations of various machining processes with regard to shape formation and surface quality and the impact this has on design • Explain the relationship between manufacturing technology and systems, the impact of manufacturing on the economy and the relationship between materials selection, design and manufacture • Study of classification of grinding machine, types of abrasives and super finishing operations. • Able to understand linear measurement and angular measurements, limit gages plug gages as well as optical measurements. • Make accurate and precise dimensional and physical measurements. • Calculate Test Uncertainty Ratios

			<p>(TURs) – defined as the Uncertainty of the Unit Under Test to that of the Standard/Calibrator.</p> <ul style="list-style-type: none"> • Apply critical and analytical thinking skills in problem solving situations • To understand concepts of surface roughness measurement, thread measurement, machine tool alignment tests on lathe milling and drilling machine.
R20MBA2201	Business Economics & Financial Analysis	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Discuss the market dynamics namely, demand and supply, demand forecasting, elasticity of demand and supply, pricing methods and pricing in different market structures. • Justify the gain an insight into how production function is carried out to achieve least cost combination of inputs and cost analysis. • Analyze how capital budgeting decisions are carried out. • Explain the framework for both manual and computerized accounting process. • Analyze and interpret the financial statements through ratio analysis. • Explain the various methods of capital budgeting.
R20MED3104	Thermal Engineering-II	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Conduct experiments on the Boilers, Turbines. • Explain the principles of Jet Propulsion and rockets. • State the principles of steam turbines, Gas turbines, steam condensers. • Describe the applications and analysis of steam nozzles. • Discuss the types of compressors and their principles. • Explain the basic concepts of combustion analysis.
R20MTH3101	Operations Research	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Identify necessity and development of mathematical models for various industries. • Describe basic optimization and simulation techniques applied to various industries. • Recall investment analysis and game theory.

			<ul style="list-style-type: none"> Propose a queuing model based upon given data. Define the different types of simulation models. Explain the types of inventory models.
R20MED31L1	Thermal Engineering Lab	III YEAR I SEMESTER	<ul style="list-style-type: none"> Conduct performance tests on 2 strokes and 4 strokes S.I and C.I engines. Perform heat balance sheet, Morse test and motoring test on given engine. Perform the assembly and disassembly of IC engine. K5-Evaluate volumetric efficiency of air compressor practically. Draw valve timing diagrams for 4 stroke engines respectively. Summarize the working principle of boilers.
R20MED31L2	Metrology & Machine Tools Lab	III YEAR I SEMESTER	<ul style="list-style-type: none"> Explain the work on machines and usage of tools. Produce the required job as per given dimensions in different types of machines. Explain the Quick return mechanism in shaper. Describe the various types of measuring devices and its measuring methods. Operate the Lathe machine and conduct tool alignment test.
R20MED31L3	Kinematics & Dynamics Lab	III YEAR I SEMESTER	<ul style="list-style-type: none"> Analyze forces and torques of components in linkages Understand static and dynamic balance Understand forward and inverse kinematics of open-loop mechanisms To understand the critical speed of a given shaft for different n-conditions To understand the effect of gyroscope for different motions To understand time period, amplitude and frequency of un-damped free longitudinal vibration

			of single degree spring mass systems.
R20MED3201	Design of Machine Members-II	III YEAR II SEMESTER	<ul style="list-style-type: none"> • designs bearings, Pulleys, IC Engine Parts such as connecting rod, piston. Design of the belts and ropes their materials. • Study of different types of gears. • Study of the power screw and compound screw and differential screw
R20MED3202	Heat Transfer	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Formulate and predict heat conduction problems with and without heat generation in composite walls and extended surfaces subjected to convective boundaries also K4- Analyze 1D unsteady and 2D steady conduction problems. • Develop concept of boundary layer formation over heated surfaces during forced and free convection, formulation of momentum and energy equations of the solution by approximate method.. • Study of heat transfer with phase change. • Study of the heat exchangers. • Explain the radiation heat transfer concepts and state the laws related to radiation. • Calculate Nucleate boiling, critical heat flux and film boiling also categorize types of condensation.
R20MED3203	CAD & CAM	III YEAR II SEMESTER	<ul style="list-style-type: none"> • To describe the fundamental theory and concepts of the CAD/CAM. • Develop the concepts and underlying theory of modeling and the usage of models in different engineering applications. • Develop the Presentation skills • Compare the different types of modeling techniques and explain the central role solid models play in the successful completion of CAD/CAM-based product development. • Develop transformations for 2D

			<p>geometric modeling.</p> <ul style="list-style-type: none"> • Explain the basic concepts of CNC programming and machining. • Describe the principles of Computer Aided Designing systems and the concepts of Geometric modeling, solid modeling, and feature-based design modeling. • Create and design mechanical parts and elements in 2D transformations. • Distinguish the different CAD/CAM neutral files. Understand the import and export procedure of CAD/CAM electronic neutral files (IGES, STEP,.). • Compare and distinguish the difference between the operation and programming of a CNC machine tool using manual programming and the operation and programming of CNC machine tool using CAM systems. • Apply both practices (manually and CAM) to develop the G,M, S,T & F code program. • To develop APT (automatic program tool) programming. • To understand GT, CAPP, MRP, FMS, CAQC & CIM.
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Professional Elective – I

R20MED3211	Unconventional Machining Processes	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand the basic techniques of unconventional machining processes • Understand the economical aspects of unconventional machining • Understand the need and type of material to machined by unconventional methods. • Ability to extend the knowledge of unconventional machining methods to various industries such as aerospace, nuclear and defense industries. • Various unconventional machining methods are categorized based on their energies such as Mechanical, Electro Chemical, Electro Thermal and chemical energies. • Prediction of the processes for thermal EDM, LBM, PAM, WEDM and EBM. • Selection of the tool material and machining process parameters <p>Understanding of micro finishing process</p>
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			such as Magnetic Abrasive finishing, Shaped tube electro stream machining, Magnetic Abrasive Flow Finishing
R20MED3212	Machine Tool Design	III YEAR II SEMESTER	At the end of the course, the student will be able to, Understand basic motions involved in a machine tool. Design machine tool structures. Design and analyze systems for specified speeds and feeds. Select subsystems for achieving high accuracy in machining. Understand control strategies for machine tool operations. Apply appropriate quality tests for quality assurance.
R20MED3213	Production Planning & Control	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Design of production/operating system. • Develop forecasts using forecasting techniques and choose a location. • Choose a facility layout and perform work measurement. • Explain capacity planning, materials management and inventory management. • Explain the master production schedule, shop floor planning and control and material management. • Explain advanced softwares related production planning & control
R20MED3204	Finite Element Methods	III YEAR II SEMESTER	<ul style="list-style-type: none"> • To obtain an understanding of the fundamental theory of the FEA method; • To develop the ability to generate the governing FE equations for systems governed by partial differential equations; • To understand the use of the basic finite elements for structural applications using truss, beam, frame, and plane elements; and • To understand the application and use of the FE method for heat transfer problems. • To demonstrate the ability to create models for trusses, frames, plate structures, machine parts, and components using ANSYS general-purpose software; • To model multi-dimensional heat transfer problems using ANSYS; • To demonstrate the ability to evaluate and interpret FEA analysis results for

			<p>design and evaluation purposes;</p> <ul style="list-style-type: none"> • To develop a basic understanding of the limitations of the FE method and understand the possible error sources in its use. • To learn about various unconventional machining processes, the various process parameters and their influence on performance and their applications
R20MED32L1	Heat Transfer Lab	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Perform experiment and calculate the thermal conductivity through metal, insulating powder and lagged pipe. • Determine the heat transfer coefficient and heat transfer rate in natural convection, forced convection in parallel and counter flow heat exchanger. • Determine the emissivity, Stefan Boltzmann constant to estimate heat transfer through radiation by conducting experiment. • Solve the heat transfer in conduction process and to determine critical temperature of heat element. • Learn the heat pipe principle and two phase flow principle. • Study of heat transfer in pin-fin apparatus.
R20MED32L2	CAD & CAM Lab	III YEAR II SEMESTER	<ul style="list-style-type: none"> • To Create 2-D & 3-D drawings using AutoCAD. • Draw assembly drawings using PRO-E. • Determine deflections and stresses in various beams and structures by using ANSYS. • Predict natural frequencies of 2D beams and perform study state heat transfer analysis of plane and axis-symmetric components. • Develop NC code for Turning operations using CAM software and machine simple components on NC lathe by transferring NC code from CAM software.

			<ul style="list-style-type: none"> Develop NC code for free form using CAM software and machine simple components on NC Mill by transferring NC code from CAM software.
R20HAS31L1	Advanced Communication Skills lab	III YEAR II SEMESTER	<ul style="list-style-type: none"> Accomplishment of sound vocabulary and its proper use contextually. Develop Flair in Writing and felicity in written expression. Generate Enhanced job prospects. Develop the Effective Speaking Abilities. Develop the activities on group discussion activities. Create the interview skills
R20MED4101	Refrigeration & Air Conditioning	IV YEAR I SEMESTER	<ul style="list-style-type: none"> Explain different types of Basic Refrigeration cycles and its applications in multi compressor and multi evaporator systems. Describe the methods for low temperature refrigeration. Propose the selection and design of different components of Refrigeration systems. Describe functioning of different kind of heat energy operated vapour absorption systems. Recommend the selection and application of suitable/eco-friendly refrigerants. Classify Air conditioning systems and study of heat pump.
Professional Elective – II			
R20MED4121	Additive Manufacturing	IV YEAR I SEMESTER	<ul style="list-style-type: none"> Students can able to complete different methods to discuss the effects of the additive manufacturing technologies Analyse the characteristics of the different materials in additive manufacturing. Select a suitable material for Additive Manufacturing. Analyze different Methods for post-processing of additive manufacturing parts.

			<ul style="list-style-type: none"> • Understand the applications of Additive Manufacturing • Able to know the Testing of 3D printing samples.
R20MED4122	Automation in Manufacturing	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand the concept and types of automation • Assessment of degree and level of automation, Automated flow lines • To know the automation, Assembly system and line balancing • Knowledge about various components of automation like sensors, actuators • Understanding transfer lines and advanced industrial automation • To know Automated material handling and Automated storage systems , Fundamentals of Industrial control
R20MED4123	Micro Electro Mechanical Systems (MEMS)	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Students able to understand concepts applicable to MEMS, their fabrication. • To understand the basic concepts the design, analysis and testing of MEMS. • Apply the MEMS for different applications. • To understand the basic concepts and applications of Thermal Sensors and Actuators. • To understand the basic concepts and applications of Micro-Opto-Electro Mechanical Systems • To understand the basic concepts and applications Magnetic Sensors and Actuators, • To understand the basic concepts and applications Micro Fluidic Systems ,Chemical and Bio Medical Micro Systems
Professional Elective – III			
R20MED4131	Power Plant Engineering	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Basic knowledge of Different types of Power Plants, site selection criteria of each one of them. • Understanding of Thermal Power Plant Operation, turbine governing, different types of high pressure boilers including supercritical and supercharged boilers, Fluidized bed combustion systems.

			<ul style="list-style-type: none"> • Design of chimney in thermal power plants, knowledge of cooling tower operation, numerical on surface condenser design. • Basic knowledge of Different types of Nuclear power plants including Pressurized water reactor, Boiling water reactor, gas cooled reactor, liquid metal fast breeder reactor. • Understanding of Power Plant Economics, Energy Storage including compressed air energy and pumped hydro etc. • Discussing environmental and safety aspects of power plant operation.
R20MED4132	Automobile Engineering	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • List different types of Engine and their classifications. • Judge firing order for multi-cylinder engines for igniting of fuels. • Develop concept and define working of Automobile Engine cooling and lubrication system. • To understand the cooling system, ignition system of the IC engines • Transmission of the power transmission system of automobiles, suspension system of the automobiles including the rigid axle of the automobiles. • Mechanical braking system of the automobiles • Types of the steering mechanisms such as ackerman and davis. • Emission from automobiles.
R20MED4133	Renewable Energy Sources	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Explain the working principle of solar energy& radiation. • Describe the working principle of wind energy and their classification. • Classify different types of Geo thermal energy sources and their principles. • Categorize the principles of biomass conversion and its applications. • Explain the principles and utilization of OTEC plants. • Analysis of Direct energy conversion and their effects.
Professional Elective – IV			

R20MED4141	Computational Fluid Dynamics	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • To understand the basic concepts of Elementary details in numerical techniques, Applied Numerical Methods • To understand the basic concepts of Finite Difference Method and its Applications in Heat conduction and Convection • To know the Introduction to first order wave equation. • To know the basic Equations Governing Fluid Flow and Heat Transfer • To know the basic Equations in the Finite volume method • To understand the applications of CFD.
R20MED4142	Turbo Machinery	IV YEAR I SEMESTER	
R20MED4143	Fluid Power Systems	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • To understand the basic concepts of Introduction to fluid power system- Hydraulic Components • To know the basic working principles of Pneumatic Components • To know the basic working principles of Fluid power systems. • To understand the basic concepts of Electro - Pneumatics and Hydraulics • To understand the basic concepts of Application, Maintenance And Trouble Shooting • An ability to identify, formulate, and solve engineering problems
Professional Elective – V			
R20MED4251	Industrial Robotics	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Use matrix algebra for computing the kinematics of robots. • Calculate the forward kinematics and inverse kinematics of serial and parallel robots. • Calculate the Jacobian for serial and parallel robot. • Demonstrate the path planning for a robotic system. • Study of different numerical methods. • Describe the robot Application in

			manufacturing.
R20MED4252	Mechanical Vibrations	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand the causes and effects of vibration in mechanical systems and Single ,Two and Multi degrees of freedom • Develop schematic models for physical systems and formulate governing equations of motion. • Understand the role of damping, stiffness and inertia in mechanical systems • Analyze rotating and reciprocating systems and compute critical speeds. • Analyze and design machine supporting structures, Frequency domain vibration analysis • To understand the basic numerical methods
R20MED4253	Composite Materials	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Some understanding of types, manufacturing processes, and applications of composite materials • Ability to analyze problems on macromechanical behavior of lamina • Ability to analyze problems on micromechanical behavior of lamina • Ability to analyze problems on macromechanical behavior of laminate • Ability to analyze problems on bending, buckling, and vibration of laminated plates and beams • Ability to understand the failure behavior of laminates
Professional Elective – VI			
R20MED4261	Industrial Management	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • List, justify and interpret productivity models in manufacturing and service organization. • Judge product development and industrial process design. • Predict facility location and network models. • Interpret and solve data from aggregate output planning models. Knowledge of human factors in engineering and various jobs designs. • Select and analyze an inventory

			<p>control model based upon given data. Understanding of manufacturing resource and just-in-time planning.</p> <ul style="list-style-type: none"> • Predict and control the quality of an end product. • Design and model industrial systems using linear and non-linear programming approaches. • To understand the methods of job evaluation, project management by using CPM and PERT.
R20MED4262	Production Operation and Management	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Concepts of production Operation and management, • Production planning and Control • Managing of Work Environment – Automation —Technology Management - Waste Management • Product & process design, analysis, • Basic concepts of quality, dimensions of quality • Scheduling and materials management
R20MED4263	Tribology	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Describe the viscosity and laws of fluid flow with reference to lubrication • Analyze mathematical approach of hydrodynamic and hydrostatic lubrication • Describe the concept of idealized journal bearing and slider bearing under different load carrying conditions • Describe the oil flow through bearings lubricated under pressure and thermal equilibrium • Explain different bearing materials with their properties and list the advantages and disadvantages • Illustrate the behavior of tribological components subjected to different working conditions and describe different tribological measures

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

Accredited by NBA, NAAC

Sheriguda(V), Ibrahimpatnam(M), R.R.Dist. – 501510



**ELECTRONICS & COMMUNICATION
ENGINEERING**

(BR20)

PROGRAM OUTCOMES (POs)

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

COURSE OUTCOMES (COs)

Course Code	Course Name	Year / Semester	Course Outcomes
R20ECE2101	Electronic Devices and Circuits	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Describe the construction, operation and characteristics of electronic devices like P-N- Junction and special Purpose diodes. • Determine the application of diode as a rectifier • Illustrate the application of transistors as amplifier employing BJT devices • Analyse the Biasing circuits using BJT Transistor Amplifier Circuit • Evaluate construction, operation and characteristics of FET • Select Biasing circuits using FET Amplifiers
R20EEE2107	Network Theory	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Apply the knowledge of basic Magnetic Circuits • Analyze the planar networks by using Graph Theory • Analyze the three phase circuits using Star Delta • Evaluate Transient Response, Steady State response by using Laplace Transform method • Evaluate Two Port network parameter and analyze the transmission line and transistor network • Describe the basic filters and classifies the filters
R20ECE2102	Digital Logic Design	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Interpret the various number systems & code converters, error detecting and correcting, BCD, Gray Code, EX-3. • Describe the operation of logic gates and Apply Boolean Algebra on K- map. • Design / Analysis of Combinational Circuits. • Diagram illustrates the operation & timing constrains for Latches & Flip-Flops and Registers and Counters. • Design & analyze sequential circuits. • Use HDL & appropriate EDA tools for digital logic design & simulation.
R20ECE2103	Signals and Systems	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Interpret any signal in terms of complete sets of orthogonal functions and understands the principles of basic signals. • Sketch Fourier spectrum by using Fourier series and Fourier transforms. • Describe sampling theorem to reconstruct signal from its samples.

			<ul style="list-style-type: none"> • Design a distortion less LTI system and derive filter characteristics of a system. • Test parsevals theorem and explain the concepts convolution, correlation in time domain and frequency domain. • Analyze Lapalce Transforms, Fourier Transforms and Z-Transforms.
R20ECE2104	Probability Theory and Stochastic Processes	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Illustrate and formulate fundamental probability distribution and density functions, as well as functions of random variables • Explain the concepts of expectation and conditional expectation, and describe their properties • Analyze continuous and discrete-time random processes • Explain the concepts of stationary and wide-sense Stationarity, and appreciate their significance • Apply the theory of stochastic processes to analyze linear systems • Apply the above knowledge to solve basic problems in filtering, prediction and smoothing
R20ECE21L1	Electronic Devices and Circuits Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Determine the P-N-Junction diode & Zener diode characteristics. • Calculate the Input and Output characteristics of BJT and FET. • Evaluate Half Wave and Full Wave Rectifier with and without filters. • Differentiate Measurement of h-parameters of transistor in CB, CE, CC configurations. • Analyse the Frequency response of CE, CC and Common Source FET Amplifier. • Measure SCR and UJT characteristics.
R20ECE21L2	Digital Logic Design Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Explain theory of Boolean Algebra & the Underlying features of various number systems. • Use the concepts of Boolean Algebra for the analysis & design of various combinational logic circuits. • Use the concepts of Boolean Algebra for the analysis & design of various sequential logic circuits. • Design various logic gates starting from simple ordinary gates to complex

			<p>Programmable logic devices & arrays.</p> <ul style="list-style-type: none"> Analyze the various coding schemes are the part of the digital circuit design. Design of various circuits with the help of VHDL coding techniques.
R20ECE21L3	Basic Simulation Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> Interpret any signal in terms of complete sets of orthogonal functions and understands the principles of basic signals. Sketch Fourier spectrum by using Fourier series and Fourier transforms. Apply sampling theorem to reconstruct signal from its samples. Design a distortion less LTI system and derive filter characteristics of a system. Determine convolution, correlation in time domain and frequency domain. Analyze Laplace Transforms, Fourier Transforms and Z-Transforms.
R20MAC2100	Gender Sensitization Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> Describe the important issues related to gender in contemporary India. Predict basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film. Explain a finer grasp of how gender discrimination works in our society and how to counter it. Show insight into the gendered division of labour and its relation to politics and economics. Men and women students and professionals will be better equipped to work and live together as equals. Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.
R20MTH2201	Laplace Transforms, Numerical Methods & Complex	II YEAR II SEMESTER	<ul style="list-style-type: none"> Use the Laplace transforms techniques for solving ODE's (k3-apply) Calculate the root of a given Equation (k3-apply)

	Variables		<ul style="list-style-type: none"> • Determine the value for the data using interpolation. (k3-apply) • Evaluate the numerical solutions for a given ODE's (k5- evaluate) • Analyse the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems (k4-analyse) • Expand complex functions in Taylor's series & Laurent's series (k2- understand)
R20ECE2201	Electromagnetic Theory And Transmission Lines	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Differentiate the electric and magnetic field intensity ,flux density and maxwell's equations for electric and magnetic static fields (K2-Understand). • Apply time varying maxwell's equations and their applications in electromagnetic propagation (K3-Apply). • Select maxwell's equations to describe the propagation of electromagnetic waves in vaccume and dielectric media (K4-Analyse). • Demonstrate the reflection and refraction of waves at boundaries (K3-Apply). • Analyse basic transmission line parameters in phasor domain and basic wave guide operations and parameters (K4-Analyse). • Measure the input and output impedances of transmission lines (K5-Evaluate).
R20ECE2202	Analog and Digital Communications	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Differentiate various elements, processes, and parameters in communication systems, and describe their functions, effects, and interrelationship (K2-Understand). • Analyze and compare different analog modulation schemes for their efficiency and Bandwidth (K4-Analyse). • Illustrate the behavior of a communication system in presence of noise (K3-Apply). • Describe pulse modulation system and analyze their system performance (K4-Analyse). • Analyze different digital modulation schemes and to compute the bit error performance (K4-Analyse). • Understand basic knowledge of optimum

			demodulation of digital signals (K2-Understand).
R20ECE2203	Linear and Digital IC Applications	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Interpret the operational amplifiers with linear integrated circuits (K2-Understand). • Demonstrate the operational amplifiers for various applications (K3-Apply). • Describe the circuits based on analog to digital and digital to analog converters (K2-Understand). • Describe the different families of digital integrated circuits and their characteristics (K2-Understand). • Analyze the concepts of combinational and sequential circuits (K4-Analyse). • Evaluate the characteristics of memory and their classification (K5-Evaluate).
R20ECE2204	Electronic Circuit Analysis	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Interpret the single stage amplifiers and multi stage amplifiers. (K2-Understand) • Analyze the DC bias circuitry of BJT and FET. (K4-Analyse) • Describe the types of amplifier operation and characteristics. (K2-Understand) • Test the operation of oscillators.(K5-Evaluate) • Determine efficiency of power amplifier. (K3-Apply) • Design tuned amplifiers and bandwidth by using BJT. (K6-Create)
R20ECE22L1	Analog and Digital Communications Lab	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Generate AM wave and calculate the modulation index of AM wave and predict the modulation index (β) of FM wave and simulate (K6-Create). • Tabulate the values of gain in Pre-Emphasis & De-Emphasis and analyse and simulate various pulse modulation techniques (K4-Analyse) • Interpret the input and output characteristics of AGC receivers and analyze simulate TDM and FDM multiplexing methods. (K4-Analyse) • Describe the basic components of digital communication systems and base band data transmission concepts (K2-Understand) • Analyze the error performance of the digital modulation techniques (K4-Analyse)

			<ul style="list-style-type: none"> • Demonstrate the design of optimum receivers for the digital modulation techniques (K3-Apply)
R20ECE22L2	IC Applications Lab	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand the concepts of operational amplifier IC 741, Timer IC 555 & its specifications.(K2-Understand). • Interpret the operational amplifiers with linear integrated circuits (K2-Understand). • predict the operational amplifiers for various applications.(K3-Apply). • Diagram illustrate the frequency response of first order HPF and LPF. (K4-Analyse). • Sketch the circuits using operational amplifiers for waveform generator (K3-Apply). • Calculate the pulsewidth of Mo
R20ECE22L3	Electronic Circuit Analysis Lab	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Calculate the gain and bandwidth of common emitter and common base amplifier by using BJT (K3-Analysis). • Calculate the gain and bandwidth of common emitter and common source and common gate amplifier by using FET (K3-Analysis). • Differentiate gain and bandwidth of the single stage and two stage RC coupled amplifiers (K2- Understand). • Analyze the values of gain in feedback amplifiers techniques (current shunt and voltage series) (K4-Analyse). • Differentiate the theoretical and practical values of operating frequency in oscillators using transistors (K2-Understand). • Measure the efficiency of class A and class B power amplifiers (K5-evaluate).
R20MAC2200	Intellectual Property Rights	II YEAR II SEMESTER	
R20MBA2201	Business Economics & Financial Analysis	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand the market demand and supply analysis and pricing in different market structures (K2-Understand). • Analyze how production functions are carried out and analyze the cost (K4-Analyse). • understand different markets and types of business organization (K2-Understand). • Analyze how capital budgeting decisions are carried out (K4-Analyse).

			<ul style="list-style-type: none"> • understand the framework for both manual and computerized accounting process (K2-Understand). • Analyze and interpret financial statements through ratio analysis (K4-Analyse).
R20ECE3101	Microprocessors & Microcontrollers	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Describe the internal details of microprocessors 8086 • Interpret the various types of instruction sets of microprocessor 8086 to write programs. • Analyze and apply different interfacing techniques to interface I/O devices with microprocessor 8086. • Describe the internal details of microcontroller 8051 • Interpret the various types of instruction sets of microcontroller 8051 to write programs. • Analyze and apply different programming techniques to control its supporting peripheral devices in real time.
R20INF3103	Data Communications and Networks	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand the terminology and concepts of the O reference model and the TCP-IP reference model.(Understand) • Demonstrate the transmission media, design issues and determine the CRC codes.(Apply) • Classify the various protocols of physical layer and MAC layer.(Analyse) • Explain the design issues, switching and evaluate the routing algorithms of network layer. (Evaluate) • Examine the various Internetworking and Internet Transport protocols.(Apply) • Design a network based on a specified network layer protocols.(Create)
R20EEE2202	Control Systems	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Classify the control systems and feedbacks (K4-Analyse) • Sketch the block diagram of electrical systems and signal flow graphs (K3-Apply) • Analyze the time response and transient response of first order, second order systems proportional derivative proportional integral systems stability of control systems in S-domain through RH criteria (K4-Analyse) • Sketch the root locus by adding poles and zeros (K3-apply) • Analyse the frequency response of system from bode plots, polar plots and nyquist plots(K4- analyse) • Compare the state transition matrix with

			transfer function (K5-Evaluate)
Professional Elective – I			
R20CSE3114	Computer Organization & Operating Systems	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Conceptually understand basic structure of computer, register transfer language and micro operations. (K2-Understanding) • Understand working process and design of micro programmed control unit. (K2-Understanding) • Understand concepts of memory, input-output organization. (K2-Understanding) • Understand functions, services of operating system. (K2-Understanding) • Understand memory management, dead lock and file management concepts. (K2 Understanding) • Design operating system (K6-Creating)
R20ECE3112	Coding Theory & Techniques	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Describe the concepts of error control strategies. (K2-understand) • Evaluate linear block codes like syndrome calculation, minimum distance, error detection and correction of block codes.(K5-Evaluate) • Generate Generator Matrix, Parity-Check Matrix and Error-Correcting Capability of cyclic Codes. (K6-Create) • Analyze convolution codes and various decoding techniques.(K4-Analyse) • Analyze single error and burst error correcting cyclic codes and convolution codes. (K4-Analyse) • Understand BCH Codes and the encoding and decoding techniques. (K2-understand)
R20ECE3113	Electronic Measurements & Instrumentation	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Describe the fundamental concepts and principles of instrumentation • Explain the operations of the various instruments required in measurements like digital multi meter, vector voltmeter. • Apply the measurement techniques for different types of tests. • Select specific instrument for specific measurement function. • Apply knowledge of different oscilloscopes like CRO, DSO. • Understand functioning, specification, and applications of signal analyzing instruments.
R20ECE31L1	Microprocessors &	III YEAR I	<ul style="list-style-type: none"> • Develop the programs for 16-bit arithmetic operation, sorting, searching, string

	Microcontrollers Lab	SEMESTER	<p>manipulations on 8086 microprocessor. (K6-Creating)</p> <ul style="list-style-type: none"> • Design and develop program for digital clock, parallel communication using 8255 and serial communication using 8251. (K6-Creating) • Demonstrate and write program for interfacing ADC, DAC and stepper motor to 8086. (K3-apply) • Develop the programs for arithmetic, logical and bit manipulation instructions of 8051 and verify Timer/counter, interrupt handling in 8051 microcontroller. (K6-Creating) • Demonstrate the interfacing of LCD and Matrix/keyboard to 8051 and communication between 8051 kit and PC. (K3-apply) • Develop the program for UART and data transfer program from peripheral to memory through DMA controller 8237/8257. (K6-Creating)
R20INF31L2	Data Communications and Networks Lab	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Apply appropriate algorithm for the finding of shortest route. (K3-Apply) • Develop the routing table System / Software Requirement. (K6-Create) • Analysis the performance of various protocols in different layers. (K4-Analyze) • Create communication between two desktop computers. (K6-Create) • Apply appropriate algorithm for the finding of shortest route. (K3-Apply) • Use appropriate network tools to build network topologies. (K3-Apply)
R20HAS31L1	Advanced Communication Skills Lab	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Speak effectively (Apply, K3) • Express and communicate fluently and appropriately in social professional contexts (Apply, K3) • The development of comprehensive ability through English language enables the students in understanding and assimilating other engineering subjects (Understand K2) • The awareness of English lab enriches their communication and soft skills contributing to their overall

			<p>development and success(Analyze, K4)</p> <ul style="list-style-type: none"> • Draft various letters and reports for all official purpose (Create K6) • Take part in social and professional communication (Apply, K3)
R20ECE3201	Antennas and Wave Propagation	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Explain basic terminology and concepts of Antennas (K2-Understanding). • Discuss the basic parameters those are considered in the antenna design process and the analysis (K2-Understanding). • Calculate the electric and magnetic field emission from various basic antennas and mathematical formulation of the analysis (K3-apply). • Select designed antenna and field evaluation under various conditions(K4-Analyse). • design antennas that suits the propagation of the waves at different frequencies through different layers in the existing layered free space environment structure (K6-Creating). • Design the bench setup for antenna parameter measurement of testing for their effectiveness (K6-Creating).
R20ECE3202	Digital Signal Processing	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Restate time, frequency and Z - transform analysis on signals and systems. (K2 Understand) • Differentiate the inter-relationship between DFT and various transforms. (K2 Understand) • Analyze the Fast computation of DFT and appreciate the FFT processing (K4 Analyze) • Analyze IIR Digital Filters for a given specifications (K4 Analyze) • Design FIR Digital filters using Window Techniques. (K6 Create) • Evaluate the multi rate DSP techniques and finite word length effects. (K5 Evaluate)
R20ECE3203	VLSI Design	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Describe the fabrication process of integrated circuit using MOS transistors. (K2-Understand) • Choose an appropriate inverter depending on specifications required for a circuit. (K4-analyse) • Sketch the layout and estimate parasitics of any logic circuit. (K3-Apply) • Design different types of logic gates using CMOS inverter. (K6- Create) • Design building blocks of datapath using

			<p>gates and memories using MOS transistors. (K6-Create)</p> <ul style="list-style-type: none"> • Design Programmable logic devices and interpret the concept of testing to improve testability of system. (K6-Create)
Professional Elective - II			
R20ECE3221	Embedded System Design	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Explain the history ,classification, characteristics, applications ,quality attributes and purpose of embedded systems(K2-Understand) • Describe the core of the embedded systems and categorize the types of memories and memory selection sensors and actuators and communication interfaces (K2-Understand) • Apply the various embedded systems hardware circuits and embedded firmware design approaches and Development languages (K3-Apply) • Discuss the basics of Operating systems and RTOS and explain multitasking and multiprocessing. (K2-Understand) • Select the task communication via shared memory Message Passing, Remote Procedure Call and Sockets and explain the Device Drivers (K4-Analyse) • Predict the Task Communication/Synchronization Issues and Techniques, and choose an RTOS. (K5-Evaluate)
R20CSE4152	Internet of Things (IOT)	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Able to understand the application areas of IOT • Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks • Able to understand building blocks of Internet of Things and characteristics
R20CSE3201	Machine Learning	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Student Should be we to understand the basic concepts such decision tree and neural networks. • Ability to formulate machine learning techniques to respective problems. • Apply machine learning algorithms to solve problems of moderate complexity.
R20ECE32L1	Digital Signal Processing Lab	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Generate sinusoidal waveforms on recursive difference equation and through filtering and DTMF signals. (K6-Create) • Sketch the characteristic of FFT of a given sequence for LP FIR,HP FIR,LP IIR,HP IIR filters.(K3-Apply) • Calculate the DFT/IDFT of given DT signal

			<p>and show the frequency response of given system. Impulse response of first order and second order systems. (K3-Apply)</p> <ul style="list-style-type: none"> • Determine the power spectrum of a given sequence. (K3-Apply) • Diagram illustrates of Decimation, Interpolation and I/D sampling rate converters. (K4-Analyse) • Experiment the audio application and noise removal. (K3-Apply)
R20ECE32L2	e – CAD Lab	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Describe Verilog hardware description languages (HDL) (K2-Understand). • Design various logic gates using HDL. (K6-Create) • Use the concepts of Boolean algebra for the analysis & design of various combinational logic circuits. (K3-Apply) • Use the concepts of Boolean algebra for the analysis & design of various sequential logic circuits. (K3-Apply) • Design Entry, simulation of flip-flop circuits with test bench & functional verification. (K6-Create) • Describe the Finite state machine (K2-Understand).
R20ECE4101	Microwave and Optical Communication	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Analyze the (microwave active devices) various Microwave solid state devices, Bipolar transistors, FET, & microwave tubes. (K4- ANALYZE) • Demonstrate the (microwave active devices) waveguide multiport junctions, ferrite devices. (K3- APPLY) • Measure the scattering matrix and microwave parameters using Microwave Bench setup (K5- EVALUATE) • Describe the constructional parameters of optical fibers and calculate the losses. (K3-Apply) • Explain the optical sources and choose the optical detectors. (K4-Analyse) • Evaluate optical system, power budget analysis and networking. (K5-Evaluate)
R20HAS4101	Professional Practice, Law &	IV YEAR I	<ul style="list-style-type: none"> • To familiarise the students to what constitutes professional practice,

	Ethics	SEMESTER	<p>introduction of various stakeholders and their respective roles; understanding the fundamental ethics governing the profession</p> <ul style="list-style-type: none"> • To give a good insight into contracts and contracts management in civil engineering, dispute resolution mechanisms; laws governing engagement of labour • To give an understanding of Intellectual Property Rights, Patents. • To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession • To develop good ideas of the legal and practical aspects of their profession
Professional Elective – III			
R20ECE4131	Digital Image Processing	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Define basics of images and analyze the various advanced image transforms and Properties. (K3-Apply). • Discuss different techniques employed for enhancement (spatial and frequency domain) and restoration of images. (K2-Understanding) • Determine degradation model and calculate various restoration techniques. (K3-Apply). • Analyze the concepts of segmentation and various basic morphological operations in image processing. (K4-Analyse). • Describe the various compression techniques explain redundancies and their removal methods (K2-understanding). • Evaluate various compression coding techniques and compare JPEG standards. (K5-Evaluate)
R20CSE4101	Cryptography and Network Security	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand basic cryptographic algorithms, message and web authentication and security issues. (K2-Understand) • Describe information system requirements for both of them such as client and server. (K2-Understand) • Understand the current legal issues towards information security. (K2-Understand) • Understand the basic categories of threats to computers and networks (K2-Understand) • Generate and distribute a PGP key pair and use the PGP package to send an encrypted e-mail message. (K6-Create) • Discuss Web security and Firewalls (K2-Understand)
R20CSE4142	Artificial Intelligence (AI)	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Possess the ability to formulate an efficient problem space for a problem expressed in English.

			<ul style="list-style-type: none"> • Possess the ability to select a search algorithm for a problem and characterize its time and space complexities. • Possess the skill for representing knowledge using the appropriate technique. • Possess the ability to apply AI techniques to solve problems of Game Playing, Expert Systems, Machine Learning and Natural Language Processing.
Professional Elective – IV			
R20ECE4141	Cellular & Mobile Communications	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Analyse the fundamental techniques to overcome the difficult fading effects(K4-Analyse) • Interpret the cellular concepts /Frequency reuse (K2 –Understand) • Describe the co-channel and non co channel interferences (K2-Understand) • Illustrate the cell coverage for signal and traffic, diversity techniques and mobile antennas (K3-Apply) • Outline the frequency management and channel assignment (K4-Analyse) • Explain the types of handoff and handoff's strategies (K2-Understand)
R20ECE4142	Digital Signal Processors & Architectures	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Determine the fundamentals of fixed and floating point architectures of various DSP's (K3- Apply) • Describe the knowledge & concepts of digital signal processing techniques. (K2 Understand). • Compare the DSP computational building blocks (K5- Evaluate) • Demonstrate the Architecture of TMS32054XX devices. (K3- Apply) • Analyze the Architecture of ADSP2100, ADSP2181 devices. (K4- Analyze) • Explain Memory Interfacing in DSP Devices (K2-Understand).
R20ECE4143	System on Chip Architecture	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Describe the abstraction in hardware design MUO a simple processor, processor design trade off and design for low power consumption. (K2-Undestand) • Explain about the ACORN RISC Machine (ARM) architecture and concepts and interface with co processor. (K2-Understand) • Use ARM instructions for programming and explain architectural support for high level language. (K3-Apply) • Demonstrate the memory size and speed, on

			<p>chip memory, cache design and memory management. (K3-Apply)</p> <ul style="list-style-type: none"> • Diagram illustrate the advance micro controller bus architecture, memory interface, ARM reference peripheral specification, prototyping tools and debug architecture. (K4-Analyse) • Discuss about operating systems ARM system control co processor CP15 protection unit and its registers, MMU registers architecture and context switching. (K2-Understanding)
R20ECE41L1	Microwave & Optical Communications Lab	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Analyze the characteristic of microwave tubes and compare them (K4- Analyze) • Explain the various Microwave solid state devices. (K2-Understand) • Measure the scattering matrix and microwave parameters using Microwave Bench setup (K5- Evaluate) • Calculate the power dividing properties of various Microwave junctions, directional couplers & ferrite devices.(K3-Apply) • Analyze the optical sources like LED and LASER diode (K4-Analyze) • Calculate the Data rate for Digital Optical Link, NA and losses in Analog Optical Link. (K3-Apply)
R20ECE4251	Satellite Communications	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Describe the history, frequency allocations, applications and orbit concepts and Placement of a Satellite in a Geo-Stationary orbit (K2- Understand) • Demonstrate satellite Subsystems like Attitude and Orbit Control system, Telemetry, Tracking, Command Satellite Antenna Equipment.(K3-Apply) • Apply the system Noise Temperature and G/T ratio, Link and Interference Analysis, and design of satellite Links for a specified C/N, Link Budget .(K3-Apply) • explain the different attenuations and classify the multiple access systems (K4 Analyse) • Describe the earth station technology, Power Test Methods, Lower Orbit Considerations. Navigation and GPS (K2-Understand) • Compare the different satellite packet communications (K5-Evaluate)
R20ECE4252	Low Power VLSI	IV YEAR II	<ul style="list-style-type: none"> • Describe various CMOS fabrication process and its modeling. (K2-Understanding)

		SEMESTER	<ul style="list-style-type: none"> • Understand deep submicron processes of CMOS/BICMOS technology. (K2-Understanding) • Analyze the behavior and models of MOSFET. (K4-Analyze) • Design the conventional CMOS/BICOMS logic circuits. (K6-Create) • Design the low voltage and low power CMOS/BICOMS logic circuits for various applications. (K6-Create) • Illustrate the different types of sequential, memory circuits and their design. (K3-Apply)
R20ECE4253	Wireless Sensor Networks	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand the basis of wireless sensor networks (K2-Understand). • Illustrate the state-of-the-art in wireless sensor networks, architectures and applications (K3- Apply) • Describe the design, frame work and the performance of MAC layer protocols of wireless sensor networks (K2-Understand). • Analyze existing network layer protocols and routing metrics (K4- Analyze) • Explain time Synchronization protocols in wireless sensor networks (K2-Understand). • Interpret the fundamentals and challenges of security in wireless sensor networks (K2-Understand).
Professional Elective – VI			
R20ECE4261	Wireless Communication & Networks	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Define and explain the cellular concepts and all design fundamentals. (K2-understand) • Demonstrate the Radio wave propagation indoor and outdoor propagation models. (K3-Apply) • Illustrate the small scale fading and multipath measurements. (K3-Apply) • Analyze the various Equalization & Diversity techniques used in wireless communication.(K4- Analyze) • Describe some of the existing and emerging wireless standards. (K2-understand) • Compare various wireless area networks and their specifications. (K5-Evaluate)
R20ECE4262	Electronic Product Design & Packaging	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand why and how any semiconductor device is packaged and assembled (K2-Understand). • Interpret inter-disciplinarity of packaging involving electrical, mechanical, thermal, materials, and processes (K2-Understand).

			<ul style="list-style-type: none"> • Describe CAD used in designing wiring boards (K2-Understand). • Analyze the surface mount technology, thermal design considerations in system packaging (K4- Analyze) • Predict electronic system PCB or Integrated circuit design specifications. (K3- Apply) • Illustrate the embedded passives and their processes (K3- Apply).
R20ECE4263	Radar Systems	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Summarize the radar fundamentals and analysis of the radar signals. (K2 Understanding) • Predict range performance and integration of radar (K3-apply) • Assess Range and Doppler Effect of CW and FM-CW radar (K5-Evaluate) • Judge the parameters of MTI and PULSE DOPPLER RADARS PERFORMANCE. (K5-Evaluate) • Categorize various systems tracking Radar and their comparisons. (K4-analyse) • Predict / detect various radar signals in noise and measurement of receiver parameters (K3- apply)

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

Accredited by NBA, NAAC

Sheriguda(V), Ibrahimpatnam(M), R.R.Dist. – 501510



COMPUTER SCIENCE & ENGINEERING
(BR20)

PROGRAM OUTCOMES (POs)

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

COURSE OUTCOMES (COs)

Course Code	Course Name	Year / Semester	Course Outcomes
R20ECE2105	Analog Electronics	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Describe the construction, operation and characteristics of electronic devices like P-N- Junction and special Purpose diodes (Understand). • Determine the application of diode as a rectifier (Apply) • Illustrate the application of transistors as amplifier employing BJT devices (Apply) • Analyze the Biasing circuits using BJT Transistor Amplifier Circuit (Analyze) • Evaluate construction, operation and characteristics of FET (Evaluate) <p>Select Biasing circuits using FET Amplifiers (Analyze)</p>
R20CSE2101	Data Structures	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Ability to select the data structures that efficiently model the information in a problem. (Understand) • Ability to assess efficiency trade-offs among different data structure implementations or combinations. (Create) • Implement and know the application of algorithms for sorting and searching. (Create) • Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees (Create) • Ability to select the data structures that efficiently model the information in a problem (Analyze) • Illustrate the concept of Text pattern matching algorithm (Analyze)
R20MTH2102	Computer Oriented Statistical Methods	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Describe the probability of an event, product rule, addition rule & boye's rule(Understand) • Explain Random variables and chebyshev's theorem , Discrete probability distribution(Understand) • Calculate the areas under the normal curve & applications of the normal distribution(Apply) • Analyze the fundamental sampling distributions(Analyze) • Test the Hypothesis of single mean, double mean,

			<ul style="list-style-type: none"> single proportion, double proportion(Evaluate) Evaluate Transition Probabilty matrix(Evaluate)
R20CSE2102	Computer Organization & Architecture	II YEAR I SEMESTER	<ul style="list-style-type: none"> Compare the architectures of different computers.(Evaluate) Identify different hardware components associated with the memory organization of a computer(Remember) Evaluation of address of an operand by using various addressing modes. (Understand) Summarizes the memory organization(Understand) Describe the architecture of 8086 microprocessor.(Understand) Design and implement simple systems using 8086 processor with the knowledge of pin diagram, registers and instruction formats of 8086 processor by writing assembly language programs. (create)
R20CSE2103	Object Oriented Programming using C++	II YEAR I SEMESTER	<ul style="list-style-type: none"> Distinguish the procedural and object oriented paradigm along with principles(Analyze) Understand dynamic memory management techniques using pointers, constructors, destructors, etc (Understand) Describe the concept of function overloading, operator overloading, virtual functions and polymorphism.(Understanding) Classify inheritance with the understanding of early and late binding (Understand) Illustrate the process of data file manipulations using C++ (Apply) An ability to incorporate Exception handling in Object Oriented programs(Analyze)
R20ECE21L4	Analog Electronics Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> Determine the P-N-Junction diode & Zener diode characteristics. Calculate the Input and Output characteristics of BJT and FET. Evaluate Half Wave and Full Wave Rectifier with and without filters. Differentiate Measurement of h-parameters of transistor in CB, CE, CC configurations. Analyse the Frequency response of CE, CC and Common Source FET Amplifier. Measure SCR and UJT characteristics.

R20CSE21L1	Data Structures Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Design a program to implement the linear data structures using static and dynamic memory allocation. (Create)) • Design a program to implement searching ,sorting techniques for the given problem.(Create) • Demonstrate the fundamental algorithms of tree data structures by experimenting the programs.(Apply) • Examine the traversing of a given graph by using the respect to graph traversal techniques(Apply) • Design a program to implement the pattern matching algorithms for the given problem.(Create)
R20CSE21L2	IT Workshop Lab	II YEAR I SEMESTER	
R20CSE21L3	C++ Programming Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Ability to develop applications for a range of problems using object-oriented programming (Create) • Programs to demonstrate the implementation of constructors, destructors and operator overloading. (Apply) • Apply virtual and pure virtual function & complex program situations(Apply) • Apply fundamental algorithmic problems including type casting, inheritance, and polymorphism. (Apply) • Understand generic programming, templates, file handling. (Understand) • Handle exceptions in programming (Analyze)
R20MAC2100	Gender Sensitization Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Students will have developed a better understanding of important issues related to gender in contemporary India. • Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film. • Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.

			<ul style="list-style-type: none"> • Students will acquire insight into the gendered division of labour and its relation to politics and economics. • Men and women students and professionals will be better equipped to work and live together as equals. • Students will develop a sense of appreciation of women in all walks of life. • Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.
R20CSE2201	Discrete Mathematics	II YEAR II SEMESTER	<ul style="list-style-type: none"> • For a given logic sentence express it in terms of predicates, quantifiers, and logical connectives • For a given a problem, derive the solution using deductive logic and prove the solution based on logical inference • For a given a mathematical problem, classify its algebraic structure • Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra <p>Develop the given problem as graph networks and solve with techniques of graph theory.</p>
R20ECE2102	Digital Logic Design	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Interpret the various number systems & code converters, error detecting and correcting, BCD, Gray Code, EX-3. • Describe the operation of logic gates and Apply Boolean Algebra on K-map. • Design / Analysis of Combinational Circuits. • Diagram illustrates the operation & timing constrains for Latches & Flip-Flops and Registers and Counters. • Design & analyze sequential circuits. • Use HDL & appropriate EDA tools for digital logic design & simulation.
R20CSE2202	Operating Systems	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Apply optimization techniques for the improvement of system performance. • Ability to understand the synchronous and asynchronous communication mechanisms in their respective OS. • Learn about minimization of turnaround time, waiting time and response time and

			<p>also maximization of throughput with keeping CPU as busy as possible.</p> <ul style="list-style-type: none"> • Ability to compare the different OS
R20CSE2203	Database Management Systems	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Demonstrate the basic elements of a relational database management system. • Ability to identify the data models for relevant problems. • Ability to design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data. • Apply normalization for the development of application software's
R20CSE2204	Java Programming	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Understanding of OOP concepts and basics of java programming (Console and GUI based) • The skills to apply OOP and Java programming in problem solving. • Should have the ability to extend his/her knowledge of Java programming further on his/her own.
R20CSE22L1	Operating Systems Lab	II YEAR II SEMESTER	<ul style="list-style-type: none"> • The course objectives ensure the development of students applied skills in operating systems related areas. • Students Williams knowledge in writing Software routines Modules or implementing various concepts of Operating systems
R20CSE22L2	Database Management Systems Lab	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Ability to design and implement a database schema for given problem. • Be capable to Design and build a GUI application. • Apply the normalization techniques for development of application software to realistic problems. • Ability to formulate queries using SQL DML/DDL/DCL commands.
R20CSE22L3	Java Programming Lab	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Basics of java programming, multi-threaded programs and Exception handling. • The skills to apply OOP in Java programming in problem solving. • Ability to access data from a DB with Java programs. • Use of GUI components (Console and GUI based).

R20MAC2200	Intellectual Property Rights	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Intellectual property right, Deborah. E. Bouchoux, Cengage learning. • Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tate McGraw Hill Publishing company ltd.,
R20MBA2201	Business Economics & Financial Analysis	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand the market dynamics namely, demand and supply, demand forecasting, elasticity of demand and supply, pricing methods and pricing in different market structures. • Gain an insight into how production function is carried out to achieve least cost combination of inputs and cost analysis. • Develop an understanding of • Analyse how capital budgeting decisions are carried out. • Understanding the framework for both manual and computerised accounting process • Know how to analyse and interpret the financial statements through ratio analysis.
R20CSE3102	Software Engineering	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Analyze characteristics, nature and role of a software and process models that are used to build a professional software(analyze) • Describe the requirements ,differentiate the functional and non-functional requirements, user and system requirements with respect to preparing the SRS document and perform feasibility study (understand) • Illustrate various system models with respect to the nature of software to be developed (analyze) • Create software architecture and design the components, interfaces of software process by using design engineering concepts (create) • Measure the product metrics, develop and apply software testing strategies for software applications(evaluate) • Evaluate quality control and ensures good quality software , risk management (evaluate)
R20CSE3103	Computer Networks	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand the terminology and concepts of the OSI reference model and the TCP-IP reference model.(Understand) • Demonstrate the transmission media, design issues and determine the CRC codes.(Apply)

			<ul style="list-style-type: none"> • Classify the various protocols of physical layer and MAC layer.(Analyse) • Explain the design issues, switching and evaluate the routing algorithms of network layer.(Evaluate) • Examine the various Internetworking and Internet Transport protocols.(Apply) • Design a network based on a specified network layer protocols.(Create)
R20CSE3104	Web Technologies	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Describe PHP and PHP utilities for server side scripting (Understand). • Implement the XML programme using PARSING METHODS (Applying) • Justify Server side programming with Java SERVLET'S and JSP(Evaluate) • Explain database connectivity in JSP with an Example .(Create) • Discuss about java script with declaration of variables and functions.(Understand) • Developing a college web site using PHP.(Create)
Professional Elective-I			
R20CSE3111	Advanced Computer Architecture	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Evaluate Performance Of Different Architectures With Respect To Various Parameters • Analyze Performance Of Different ILP Techniques • Identify Cache and Memory Related Issues in Multi-Processors Possess the skill for representing knowledge using the appropriate technique.
R20CSE3112	Formal Languages & Automata Theory	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Differentiate machines by their power to recognize languages.(Understand) • Design finite state machines to solve problems in computing.(create) • Assess the properties of grammars and languages along with their acceptance and equivalence with FA. • Illustrates design of Turing machines and types of Turing machines • Differentiate the hierarchy of languages and explain the Decidability, Undecidability of Problems. • Identify formal language classes and prove language membership properties.
R20CSE3113	Principles of Programming Languages	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Define the syntax-related concepts including context-free grammars, parse trees, recursive-descent parsing, and interpretation.

			<ul style="list-style-type: none"> • Illustrate the semantic issues associated with implementations, including variable binding, scoping rules, Expression and Assignment statement and control structures. • Justify the language abstraction constructs of functions, parameter passing and co-routines. • Classify the Abstract Data Types, concurrency and Exception handling in various programming languages. • Describe the implementation of Functional programming languages and scripting languages. • Describe the implementation model of logic programming language.
Professional Elective –II			
R20CSE3121	Advanced Operating Systems	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Discuss the various synchronization, scheduling and memory management issues • Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system. • Discuss the various resource management techniques for distributed systems • Identify the different features of real time and mobile operating systems • Install and use available open source kernel • Modify existing open source kernels in terms of functionality or features used
R20CSE3122	Artificial Intelligence	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Use appropriate search algorithms for any AI problem • Represent a problem using first order and predicate logic • Provide the apt agent strategy to solve a given problem • Design software agents to solve a problem • Design applications for NLP that use Artificial Intelligence.
R20CSE3123	Distributed Databases	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Identify the introductory distributed database concepts and its structures. • Describe terms related to distributed object database design and management. • Produce the transaction management and query processing techniques in DDBMS. • Relate the importance and application of emerging database technology
R20CSE31L1	Software Engineering Lab	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand the role of software • Determine the problems occurred due to various software crisis. • Understand the need of requirements

			<p>engineering process.</p> <ul style="list-style-type: none"> • Compare the process of requirements development and requirements management. • Determine the importance of requirements classification. • Understand the difference between verification and validation process. • Determine the principle of design stating high cohesion and low coupling. • Determine the procedure of regression testing. • Understand the importance of performance testing. • Determine the concepts of software metrics used before software deployment.
R20CSE31L2	Computer Networks & Web Technologies Lab	III YEAR I SEMESTER	<p>Use LAMP Stack for web applications Use Tomcat Server for Servlets and JSPs Write simple applications with Technologies like HTML, Javascript, JAX, PHP, Servlets and JSPs Connect to Database and get results Parse XML files using Java (DOM and SAX parsers)</p>
R20HAS31L1	Advanced Communication Skills Lab	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Accomplishment of sound vocabulary and its proper use contextually. • Flair in Writing and felicity in written expression. • Enhanced job prospects. • Effective Speaking Abilities
R20CSE3201	Machine Learning	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Develop an appreciation for what is involved in learning models from data. • Understand a wide variety of learning algorithms. • Understand how to evaluate models generated from data. • Apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.
R20CSE3202	Compiler Design	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Explains the basics of compilers and construct the lexical analyzer.(Understand) • Differentiate the types of top down parsers along with their limitations.(Understand) • Differentiate the types of bottom up parsers and able to construct them.(Understand) • Explain the role of semantic analyzer and organization of symbol table for block structured and non-block structured languages.(Understand)

			<ul style="list-style-type: none"> • Demonstrate the various code optimization techniques. (Apply) • Describe the object code generation algorithms, machine dependent optimization techniques and design the machine code. (Understand)
R20CSE3203	Design and Analysis of Algorithms	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Justify the performance of algorithms through performance analysis, Probabilistic analysis and Amortized analysis.(Evaluate) • Examines the general method of divide and conquer approach on various searching, sorting and general applications.(Apply) • Illustrate the various graph and tree traversal techniques.(Analyse) • Justify the algorithm design method of greedy and dynamic programming approach on various applications.(Evaluate) • Analyse the Backtracking, Branch and Bound algorithm design methods on various applications. (Analyse) • Differentiate the NP-Hard and NP-Complete Problems. (Understand)
Professional Elective –III			
R20CSE3231	Software Testing Methodologies	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand a range of different software testing techniques and strategies for testing projects. (Understand) • Remember characteristics of Dataflow and transaction flow testing methods. (Remember) • Apply appropriate software testing tools, techniques and methods on the specific domain of the software environment. (Apply) • Illustrate the path products, expressions and flow anomaly detection with respective exhibiting testing strategies (Analyze). • Evaluate functional testing using control flow and transaction flow graphs (Evaluate). • Develop and apply testing strategies for software applications (Create).
R20CSE3232	Scripting Languages	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Ability to understand the differences between scripting languages • Ability to apply your knowledge of the

			<p>weaknesses of scripting languages to select implementation.</p> <ul style="list-style-type: none"> • Create PHP authentication Methodology for security issues. • Ability to survey many of the modern and way cool language features that show up frequently in scripting languages. • Identify PHP encryption functions and Mcrypt Package. • Understand PHP Authentication and Methodologies • Explain syntax and variables in TCL. • Understand applications internet aware Nuts and Bolts Internet Programming • Able to gain some fluency programming in Ruby, JavaScript, Perl, Python, and related languages.
R20CSE3233	Mobile Application Development	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand the technical challenges posed by current mobile devices and wireless communications; be able to evaluate and select appropriate solutions. • Understand and appreciate the need to keep up with rapid changes and new developments; be able to identify current trends in mobile communications technologies and systems. • Evaluate suitable software tools and APIs for the development of a particular mobile application and understand their strengths, scope and limitations. • Use an appropriate application development to design, write and test small interactive programs for mobile devices. • Analyze the necessity for Object Oriented Programming paradigm and over structured programming and become familiar with the fundamental concepts in OOP. • Design and develop java programs, analyzes, and interprets object oriented data and report results. • Develop high-level plans for script solutions for mobile and evaluate the post-production outcome.
R20CSE32L1	Machine Learning Lab	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand the implementation procedures for the machine learning algorithms. • Design Java/Python programs for various

			<p>Learning algorithms.</p> <ul style="list-style-type: none"> • Apply Appropriate data sets to the Machine Learning algorithms. • Identify and apply Machine Learning algorithms to solve real world problems.
R20CSE32L2	Compiler Design Lab	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Examine the role of lexical analyzer on the given input data.(Apply) • Construct Recursive Descent Parser for the given grammar.(Create) • Experiment the functionality of non-recursive descent parser(LL(1) by parsing the given input string.(Apply) • Build the intermediate code from the given source code by using various intermediate code generation techniques.(Create) • Generate the machine code from the given abstract syntax tree of the source code.(Create) • Justify the functionality of lexical analyser using LEX, FLEX or JFLEX tool.(Evaluate)
R20CSE32L3	Professional Elective-III Lab	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand the myths and facts of software testing. • Analyze and design test cases using black box testing technique which includes decision tables domain testing and transition testing. • Analyze and design test cases for a white box testing technique which includes path testing, data flow graphs and matrix representation for a given problem. • Execute how to run test script wizard and Execute how to do performance testing using testing tools including Winrunner and JMeter respectively. • Demonstrate the importance of testing and its role in need of software development
R20CSE4101	Cryptography & Network Security	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Describe network security services and mechanisms. • Symmetrical and Asymmetrical cryptography. • Data integrity, Authentication, Digital Signatures. • Various network security applications, IPSec, Firewall, IDS, Web security, Email security, and Malicious software etc.
R20CSE4102	Data Mining	IV YEAR I	<ul style="list-style-type: none"> • Understand the fundamental concepts,

		SEMESTER	<p>benefits and problem areas associated with data warehousing</p> <ul style="list-style-type: none"> • Evaluate the different models of OLAP and data preprocessing • Remember the concept, structure and major issues of data mining • Analyze and compare various data mining techniques based on different parameters. • Applying Association and classification knowledge to different data sets • Create the clusters for different data set
Professional Elective –IV			
R20CSE4141	Graph Theory	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Write precise and accurate mathematical definitions of objects in graph theory. • Use mathematical definitions to identify and construct examples and to distinguish examples from non-examples. • Validate and critically assess a mathematical proof. • Use a combination of theoretical knowledge and independent mathematical thinking in creative investigation of questions in graph theory. • Reason from definitions to construct mathematical proofs.
R20CSE4142	Informational Retrieval Systems	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Defining the various types of Retrieval strategies (Remember) • Describe different retrieval utilities for searching documents (Understand) • Illustrate the clustering and searching techniques for different data base systems.(Analyze) • Classify the different types of parsing methods. (Analyze) • Evaluate different indexing techniques to apply data Base systems.(Evaluate) • Designing theoretical model for distributed information retrieval system. (Create)
R20CSE4143	Cloud Computing	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Demonstrate knowledge of latest Technologies and how to create virtual machines in a single physical device. • Create virtual machines by using hypervisor software. • Define migration techniques and virtual machines can be migrated from one host to another host. • Understand the Cloud Services like IAAS, PAAS, SAAS and Distributed Data Storage in cloud.

			<ul style="list-style-type: none"> • Implements Monitoring and Management and Applications and SLA Management and Understand the AWS console create the S3 registration and creating buckets in the S3 cloud. • Master system evaluates different hardware components related with Distributed Cloud and best Practices in Architecting cloud applications in the AWS cloud.
Professional Elective -V			
R20CSE4151	Soft Computing	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Apply various soft computing frame works. • Design of various neural networks. • Use fuzzy logic. • Apply genetic programming. • Discuss hybrid soft computing.
R20CSE4152	Internet of Things	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Analyze various protocols for IoT • Develop web services to access/control IoT devices. • Design a portable IoT using Rasperry Pi • Deploy an IoT application and connect to the cloud. • Analyze applications of IoT in real time scenario
R20CSE4153	Software Process & Project Management	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Identify suitable life cycle models to be used. • Analyze a problem and identify and define the computing requirements to the problem. • Translate a requirement specification to a design using an appropriate software engineering methodology. • Formulate appropriate testing strategy for the given software system. • Develop software projects based on current technology, by managing resources economically and keeping ethical values.
R20CSE41L1	Cryptography & Network Security Lab	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Identify the information system requirements for a client and server. • Execute cryptographic algorithms, authentication and security issues. • Develop algorithms and methods for web security with IPV4 and IPV6. • Understand the Security and legal issues towards information security. • Implement the fundamentals of secret and public cryptography.
R20HAS4201	Organizational Behaviour	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Evolution of Management and contribution of Management thinkers • the relevance of environmental scanning,

			<p>planning and to take decisions,</p> <ul style="list-style-type: none"> • Organizing and controlling • Individual and group Behavior • Leadership and Motivation.
Professional Elective –VI			
R20CSE4261	Distributed Systems	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand foundations of Distributed Systems. • Introduce the idea of peer to peer services and file system. • Understand in detail the system level and support required for distributed system. • Understand the issues involved in studying process and resource management.
R20CSE4262	Cyber Forensics	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Understand the definition of computer forensics fundamentals. • Describe the types of computer forensics technology. • Analyze various computer forensics systems. • Illustrate the methods for data recovery, evidence collection and data seizure. • Summarize duplication and preservation of digital evidence
R20CSE4263	Human Computer Interaction	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Design effective dialog for HCI. • Design effective HCI for individuals and persons with disabilities. • Assess the importance of user feedback. • Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites. • Develop meaningful user interface.

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

Accredited by NBA, NAAC

Sheriguda(V), Ibrahimpatnam(M), R.R.Dist. – 501510



CYBER SECURITY
(BR20)

PROGRAM OUTCOMES (POs)

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

COURSE OUTCOMES (COs)

Course Code	Course Name	Year / Semester	Course Outcomes
R20ECE2106	Analog and Digital Electronics	II Year / I Semester	<ul style="list-style-type: none"> • Know the characteristics of various components. • Understand the utilization of components. • Design and analyze small signal amplifier circuits. • Learn Postulates of Boolean algebra and to minimize combinational functions • Design and analyze combinational and sequential circuits • Know about the logic families and realization of logic gates.
R20CSE2101	Data Structures	II Year / I Semester	<ul style="list-style-type: none"> • Ability to select the data structures that efficiently model the information in a problem. • Ability to assess efficiency trade-offs among different data structure implementations or combinations. • Implement and know the application of algorithms for sorting and pattern matching. • Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.
R20MTH2104	Mathematical and Statistical Foundations	II Year / I Semester	<ul style="list-style-type: none"> • Apply the number theory concepts to cryptography domain • Apply the concepts of probability and distributions to some case studies • Correlate the material of one unit to the material in other units • Resolve the potential misconceptions and hazards in each topic of study.
R20CSE2102	Computer Organization & Architecture	II Year / I Semester	<ul style="list-style-type: none"> • Understand the basics of instructions sets and their impact on processor design. • Demonstrate an understanding of the design of the functional units of a digital computer system. • Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory. • Design a pipeline for consistent execution of instructions with minimum hazards. • Recognize and manipulate representations of numbers stored in digital computers
R20CSE2104	Python Programming	II Year / I Semester	<ul style="list-style-type: none"> • Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.

			<ul style="list-style-type: none"> • Demonstrate proficiency in handling Strings and File Systems. • Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions. • Interpret the concepts of Object-Oriented Programming as used in Python. • Implement exemplary applications related to Network Programming, Web Services and Databases in Python.
R20ECE21L5	Analog and Digital Electronics Lab	II Year / I Semester	<ul style="list-style-type: none"> • Know the characteristics of various components. • Understand the utilization of components. • Design and analyze small signal amplifier circuits. • Postulates of Boolean algebra and to minimize combinational functions • Design and analyze combinational and sequential circuits • Known about the logic families and realization of logic gates.
R20CSE21L1	Data Structures Lab	II Year / I Semester	<ul style="list-style-type: none"> • Ability to develop C programs for computing and real-life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists. • Ability to Implement searching and sorting algorithms
R20CSE21L2	IT Workshop Lab	II Year / I Semester	
R20CSE21L4	Python Programming Lab	II Year / I Semester	<ul style="list-style-type: none"> • Student should be able to understand the basic concepts scripting and the contributions of scripting language • Ability to explore python especially the object-oriented concepts, and the built in objects of Python. • Ability to create practical and contemporary applications such as TCP/IP network programming, Web applications, discrete event simulations
R20MAC2100	Gender Sensitization Lab (An Activity-based Course)	II Year / I Semester	<ul style="list-style-type: none"> • Students will have developed a better understanding of important issues related to gender in contemporary India. • Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film. • Students will attain a finer grasp of how

			<p>gender discrimination works in our society and how to counter it.</p> <ul style="list-style-type: none"> • Students will acquire insight into the gendered division of labour and its relation to politics and economics. • Men and women students and professionals will be better equipped to work and live together as equals. • Students will develop a sense of appreciation of women in all walks of life. • Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.
R20CSE2201	Discrete Mathematics	II Year / II Semester	<ul style="list-style-type: none"> • Ability to understand and construct precise mathematical proofs • Ability to use logic and set theory to formulate precise statements • Ability to analyze and solve counting problems on finite and discrete structures • Ability to describe and manipulate sequences • Ability to apply graph theory in solving computing problems •
R20MBA2201	Business Economics & Financial Analysis	II Year / II Semester	<ul style="list-style-type: none"> • The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm's financial position by analysing the Financial Statements of a Company.
R20CSE2202	Operating Systems	II Year / II Semester	<ul style="list-style-type: none"> • Will be able to control access to a computer and the files that may be shared • Demonstrate the knowledge of the components of computer and their respective roles in computing. • Ability to recognize and resolve user problems with standard operating environments. • Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.
R20CSE2205	Computer Networks	II Year / II Semester	<ul style="list-style-type: none"> • Gain the knowledge of the basic computer network technology. • Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model. • Obtain the skills of subnetting and routing

			<p>mechanisms.</p> <ul style="list-style-type: none"> • Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation.
R20CSE2204	Java Programming	II Year / II Semester	<ul style="list-style-type: none"> • Able to solve real world problems using OOP techniques. • Able to understand the use of abstract classes. • Able to solve problems using java collection framework and I/o classes. • Able to develop multithreaded applications with synchronization. • Able to develop applets for web applications. • Able to design GUI based applications
R20CSE22L1	Operating Systems Lab	II Year / II Semester	<ul style="list-style-type: none"> • Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management. • Able to implement C programs using Unix system calls
R20CSE22L4	Computer Networks Lab	II Year / II Semester	<ul style="list-style-type: none"> • Implement data link layer framing methods. • Analyze error detection and error correction codes. • Implement and analyze routing and congestion issues in network design. • Implement Encoding and Decoding techniques used in presentation layer. • To be able to work with different network tools.
R20CSE22L3	Java Programming Lab	II Year / II Semester	<ul style="list-style-type: none"> • Able to write programs for solving real world problems using java collection frame work. • Able to write programs using abstract classes. • Able to write multithreaded programs. • Able to write GUI programs using swing controls in Java.
R20MAC2200	Intellectual Property Rights	II Year / II Semester	<ul style="list-style-type: none"> • Intellectual property right, Deborah. E. Bouchoux, Cengage learning. • Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tate McGraw Hill Publishing company ltd.,

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DATA SCIENCE

(BR20)

PROGRAM OUTCOMES (POs)

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

COURSE OUTCOMES (COs)

Course Code	Course Name	Year / Semester	Course Outcomes
R20CSE2201	Discrete Mathematics	II Year / I Semester	<ul style="list-style-type: none"> • Ability to understand and construct precise mathematical proofs • Ability to use logic and set theory to formulate precise statements • Ability to analyze and solve counting problems on finite and discrete structures • Ability to describe and manipulate sequences • Ability to apply graph theory in solving computing problems
R20CSE2101	Data Structures	II Year / I Semester	<ul style="list-style-type: none"> • Ability to select the data structures that efficiently model the information in a problem. • Ability to assess efficiency trade-offs among different data structure implementations or combinations. • Implement and know the application of algorithms for sorting and pattern matching. • Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.
R20MTH2104	Mathematical and Statistical Foundations	II Year / I Semester	<ul style="list-style-type: none"> • Apply the number theory concepts to cryptography domain • Apply the concepts of probability and distributions to some case studies • Correlate the material of one unit to the material in other units • Resolve the potential misconceptions and hazards in each topic of study.
R20CSE2102	Computer Organization & Architecture	II Year / I Semester	<ul style="list-style-type: none"> • Understand the basics of instructions sets and their impact on processor design. • Demonstrate an understanding of the design of the functional units of a digital computer system. • Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory. • Design a pipeline for consistent execution of instructions with minimum hazards. • Recognize and manipulate representations of numbers stored in digital computers
R20CSE2104	Python Programming	II Year / I Semester	<ul style="list-style-type: none"> • Examine Python syntax and semantics and be fluent in the use of Python flow control and functions. • Demonstrate proficiency in handling Strings and File Systems.

			<ul style="list-style-type: none"> • Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions. • Interpret the concepts of Object-Oriented Programming as used in Python. • Implement exemplary applications related to Network Programming, Web Services and Databases in Python.
R20MBA2201	Business Economics & Financial Analysis	II Year / I Semester	<ul style="list-style-type: none"> • Understand the market dynamics namely, demand and supply, demand forecasting, elasticity of demand and supply, pricing methods and pricing in different market structures. • Gain an insight into how production function is carried out to achieve least cost combination of inputs and cost analysis. • Develop an understanding of • Analyse how capital budgeting decisions are carried out. • Understanding the framework for both manual and computerised accounting process • Know how to analyse and interpret the financial statements through ratio analysis.
R20CSE21L1	Data Structures Lab	II Year / I Semester	<ul style="list-style-type: none"> • Ability to develop C programs for computing and real-life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists. • Ability to Implement searching and sorting algorithms
R20CSE21L4	Python Programming Lab	II Year / I Semester	<ul style="list-style-type: none"> • Student should be able to understand the basic concepts scripting and the contributions of scripting language • Ability to explore python especially the object-oriented concepts, and the built in objects of Python. • Ability to create practical and contemporary applications such as TCP/IP network programming, Web applications, discrete event simulations
R20MAC2100	Gender Sensitization Lab (An Activity-based Course)	II Year / I Semester	<ul style="list-style-type: none"> • Students will have developed a better understanding of important issues related to gender in contemporary India. • Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film. • Students will attain a finer grasp of how gender discrimination works in our society

			<p>and how to counter it.</p> <ul style="list-style-type: none"> • Students will acquire insight into the gendered division of labour and its relation to politics and economics. • Men and women students and professionals will be better equipped to work and live together as equals. • Students will develop a sense of appreciation of women in all walks of life. • Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.
R20CSE2206	Formal Language and Automata Theory	II Year / II Semester	<ul style="list-style-type: none"> • Able to understand the concept of abstract machines and their power to recognize the languages. • Able to employ finite state machines for modeling and solving computing problems. • Able to design context free grammars for formal languages. • Able to distinguish between decidability and undecidability. • Able to gain proficiency with mathematical tools and formal methods.
R20CSE2207	Software Engineering	II Year / II Semester	<ul style="list-style-type: none"> • Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD). • Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices. • Will have experience and/or awareness of testing problems and will be able to develop a simple testing report
R20CSE2202	Operating Systems	II Year / II Semester	<ul style="list-style-type: none"> • Will be able to control access to a computer and the files that may be shared • Demonstrate the knowledge of the components of computer and their respective roles in computing. • Ability to recognize and resolve user problems with standard operating environments. • Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.
R20CSE2203	Database Management	II Year / II Semester	<ul style="list-style-type: none"> • Gain knowledge of fundamentals of DBMS, database design and normal forms

	Systems	Semester	<ul style="list-style-type: none"> • Master the basics of SQL for retrieval and management of data. • Be acquainted with the basics of transaction processing and concurrency control. • Familiarity with database storage structures and access techniques
R20CSE2204	Java Programming	II Year / II Semester	<ul style="list-style-type: none"> • Able to solve real world problems using OOP techniques. • Able to understand the use of abstract classes. • Able to solve problems using java collection framework and I/o classes. • Able to develop multithreaded applications with synchronization. • Able to develop applets for web applications. • Able to design GUI based applications
R20CSE22L1	Operating Systems Lab	II Year / II Semester	<ul style="list-style-type: none"> • Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management. • Able to implement C programs using Unix system calls
R20CSE22L2	Database Management Systems Lab	II Year / II Semester	<ul style="list-style-type: none"> • Design database schema for a given application and apply normalization • Acquire skills in using SQL commands for data definition and data manipulation. • Develop solutions for database applications using procedures, cursors and triggers
R20CSE22L3	Java Programming Lab	II Year / II Semester	<ul style="list-style-type: none"> • Able to write programs for solving real world problems using java collection frame work. • Able to write programs using abstract classes. • Able to write multithreaded programs. • Able to write GUI programs using swing controls in Java.
R20MAC2200	Intellectual Property Rights	II Year / II Semester	<ul style="list-style-type: none"> • Intellectual property right, Deborah. E. Bouchoux, Cengage learning. • Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tate McGraw Hill Publishing company ltd.,

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**ARTIFICIAL INTELLIGENCE &
MACHINE LEARNING**

(BR20)

PROGRAM OUTCOMES (POs)

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

COURSE OUTCOMES (COs)

Course Code	Course Name	Year / Semester	Course Outcomes
R20CSE2201	Discrete Mathematics	II Year / I Semester	<ul style="list-style-type: none"> • Ability to understand and construct precise mathematical proofs • Ability to use logic and set theory to formulate precise statements • Ability to analyze and solve counting problems on finite and discrete structures • Ability to describe and manipulate sequences • Ability to apply graph theory in solving computing problems
R20CSE2101	Data Structures	II Year / I Semester	<ul style="list-style-type: none"> • Ability to select the data structures that efficiently model the information in a problem. • Ability to assess efficiency trade-offs among different data structure implementations or combinations. • Implement and know the application of algorithms for sorting and pattern matching. • Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.
R20MTH2104	Mathematical and Statistical Foundations	II Year / I Semester	<ul style="list-style-type: none"> • Apply the number theory concepts to cryptography domain • Apply the concepts of probability and distributions to some case studies • Correlate the material of one unit to the material in other units • Resolve the potential misconceptions and hazards in each topic of study.
R20CSE2102	Computer Organization & Architecture	II Year / I Semester	<ul style="list-style-type: none"> • Understand the basics of instructions sets and their impact on processor design. • Demonstrate an understanding of the design of the functional units of a digital computer system. • Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory. • Design a pipeline for consistent execution of instructions with minimum hazards. • Recognize and manipulate representations of numbers stored in digital computers
R20CSE2104	Python Programming	II Year / I Semester	<ul style="list-style-type: none"> • Examine Python syntax and semantics and be fluent in the use of Python flow control and functions. • Demonstrate proficiency in handling Strings

			<p>and File Systems.</p> <ul style="list-style-type: none"> • Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions. • Interpret the concepts of Object-Oriented Programming as used in Python. • Implement exemplary applications related to Network Programming, Web Services and Databases in Python.
R20MBA2201	Business Economics & Financial Analysis	II Year / I Semester	<ul style="list-style-type: none"> • Understand the market dynamics namely, demand and supply, demand forecasting, elasticity of demand and supply, pricing methods and pricing in different market structures. • Gain an insight into how production function is carried out to achieve least cost combination of inputs and cost analysis. • Develop an understanding of • Analyse how capital budgeting decisions are carried out. • Understanding the framework for both manual and computerised accounting process • Know how to analyse and interpret the financial statements through ratio analysis.
R20CSE21L1	Data Structures Lab	II Year / I Semester	<ul style="list-style-type: none"> • Ability to develop C programs for computing and real-life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists. • Ability to Implement searching and sorting algorithms
R20CSE21L4	Python Programming Lab	II Year / I Semester	<ul style="list-style-type: none"> • Student should be able to understand the basic concepts scripting and the contributions of scripting language • Ability to explore python especially the object-oriented concepts, and the built in objects of Python. • Ability to create practical and contemporary applications such as TCP/IP network programming, Web applications, discrete event simulations
R20MAC2100	Gender Sensitization Lab (An Activity-based Course)	II Year / I Semester	<ul style="list-style-type: none"> • Students will have developed a better understanding of important issues related to gender in contemporary India. • Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film. • Students will attain a finer grasp of how

			<p>gender discrimination works in our society and how to counter it.</p> <ul style="list-style-type: none"> • Students will acquire insight into the gendered division of labour and its relation to politics and economics. • Men and women students and professionals will be better equipped to work and live together as equals. • Students will develop a sense of appreciation of women in all walks of life. • Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.
R20CSE2206	Formal Language and Automata Theory	II Year / II Semester	<ul style="list-style-type: none"> • Able to understand the concept of abstract machines and their power to recognize the languages. • Able to employ finite state machines for modeling and solving computing problems. • Able to design context free grammars for formal languages. • Able to distinguish between decidability and undecidability. • Able to gain proficiency with mathematical tools and formal methods.
R20CSE2207	Software Engineering	II Year / II Semester	<ul style="list-style-type: none"> • Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD). • Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices. • Will have experience and/or awareness of testing problems and will be able to develop a simple testing report
R20CSE2202	Operating Systems	II Year / II Semester	<ul style="list-style-type: none"> • Will be able to control access to a computer and the files that may be shared • Demonstrate the knowledge of the components of computer and their respective roles in computing. • Ability to recognize and resolve user problems with standard operating environments. • Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.
R20CSE2203	Database	II Year / II	<ul style="list-style-type: none"> • Gain knowledge of fundamentals of DBMS,

	Management Systems	Semester	<p>database design and normal forms</p> <ul style="list-style-type: none"> • Master the basics of SQL for retrieval and management of data. • Be acquainted with the basics of transaction processing and concurrency control. • Familiarity with database storage structures and access techniques
R20CSE2204	Java Programming	II Year / II Semester	<ul style="list-style-type: none"> • Able to solve real world problems using OOP techniques. • Able to understand the use of abstract classes. • Able to solve problems using java collection framework and I/o classes. • Able to develop multithreaded applications with synchronization. • Able to develop applets for web applications. • Able to design GUI based applications
R20CSE22L1	Operating Systems Lab	II Year / II Semester	<ul style="list-style-type: none"> • Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management. • Able to implement C programs using Unix system calls
R20CSE22L2	Database Management Systems Lab	II Year / II Semester	<ul style="list-style-type: none"> • Design database schema for a given application and apply normalization • Acquire skills in using SQL commands for data definition and data manipulation. • Develop solutions for database applications using procedures, cursors and triggers
R20CSE22L3	Java Programming Lab	II Year / II Semester	<ul style="list-style-type: none"> • Able to write programs for solving real world problems using java collection frame work. • Able to write programs using abstract classes. • Able to write multithreaded programs. • Able to write GUI programs using swing controls in Java.
R20MAC2200	Intellectual Property Rights	II Year / II Semester	<ul style="list-style-type: none"> • Intellectual property right, Deborah. E. Bouchoux, Cengage learning. • Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tate McGraw Hill Publishing company ltd.,

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**COMPUTER SCIENCE &
INFORMATION TECHNOLOGY
(BR20)**

PROGRAM OUTCOMES (POs)

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

COURSE OUTCOMES (COs)

Course Code	Course Name	Year / Semester	Course Outcomes
R20ECE2105	Analog Electronics	II YEAR I SEMESTER	<ul style="list-style-type: none"> Describe the construction, operation and characteristics of electronic devices like P-N- Junction and special Purpose diodes (Understand). Determine the application of diode as a rectifier (Apply) Illustrate the application of transistors as amplifier employing BJT devices (Apply) Analyze the Biasing circuits using BJT Transistor Amplifier Circuit (Analyze) Evaluate construction, operation and characteristics of FET (Evaluate) Select Biasing circuits using FET Amplifiers (Analyze)
R20CSE2101	Data Structures	II YEAR I SEMESTER	<ul style="list-style-type: none"> Ability to select the data structures that efficiently model the information in a problem. (Understand) Ability to assess efficiency trade-offs among different data structure implementations or combinations. (Create) Implement and know the application of algorithms for sorting and searching. (Create) Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees (Create) Ability to select the data structures that efficiently model the information in a problem (Analyze) Illustrate the concept of Text pattern matching algorithm (Analyze)
R20MTH2102	Computer Oriented Statistical Methods	II YEAR I SEMESTER	<ul style="list-style-type: none"> Describe the probability of an event, product rule, addition rule & boye's rule(Understand) Explain Random variables and chebyshev's theorem , Discrete probability distribution(Understand) Calculate the areas under the normal curve & applications of the normal distribution(Apply) Analyze the fundamental sampling distributions(Analyze) Test the Hypothesis of single mean, double mean, single proportion, double proportion(Evaluate) Evaluate Transition Probabilty matrix(Evaluate)
R20CSE2102	Computer Organization &	II YEAR I SEMESTER	<ul style="list-style-type: none"> Compare the architectures of different computers.(Evaluate) Identify different hardware components

	Architecture		<p>associated with the memory organization of a computer(Remember)</p> <ul style="list-style-type: none"> • Evaluation of address of an operand by using various addressing modes. (Understand) • Summarizes the memory organization(Understand) • Describe the architecture of 8086 microprocessor.(Understand) • Design and implement simple systems using 8086 processor with the knowledge of pin diagram, registers and instruction formats of 8086 processor by writing assembly language programs. (create)
R20CSE2103	Object Oriented Programming using C++	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Distinguish the procedural and object oriented paradigm along with principles(Analyze) • Understand dynamic memory management techniques using pointers, constructors, destructors, etc (Understand) • Describe the concept of function overloading, operator overloading, virtual functions and polymorphism.(Understanding) • Classify inheritance with the understanding of early and late binding (Understand) • Illustrate the process of data file manipulations using C++ (Apply) • An ability to incorporate Exception handling in Object Oriented programs(Analyze)
R20ECE21L4	Analog Electronics Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Determine the P-N-Junction diode & Zener diode characteristics. • Calculate the Input and Output characteristics of BJT and FET. • Evaluate Half Wave and Full Wave Rectifier with and without filters. • Differentiate Measurement of h-parameters of transistor in CB, CE, CC configurations. • Analyse the Frequency response of CE, CC and Common Source FET Amplifier. • Measure SCR and UJT characteristics.
R20CSE21L1	Data Structures Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Design a program to implement the linear data structures using static and dynamic memory allocation. (Create)) • Design a program to implement searching ,sorting techniques for the given problem.(Create) • Demonstrate the fundamental algorithms of tree data structures by experimenting the programs.(Apply) • Examine the traversing of a given graph by using the respect to graph traversal techniques(Apply) • Design a program to implement the pattern matching algorithms for the given problem.(Create)

R20CSE21L2	IT Workshop Lab	II YEAR I SEMESTER	
R20CSE21L3	C++ Programming Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Ability to develop applications for a range of problems using object-oriented programming (Create) • Programs to demonstrate the implementation of constructors, destructors and operator overloading. (Apply) • Apply virtual and pure virtual function & complex program situations (Apply) • Apply fundamental algorithmic problems including type casting, inheritance, and polymorphism. (Apply) • Understand generic programming, templates, file handling. (Understand) • Handle exceptions in programming (Analyze)
R20MAC2100	Gender Sensitization Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Students will have developed a better understanding of important issues related to gender in contemporary India. • Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film. • Students will attain a finer grasp of how gender discrimination works in our society and how to counter it. • Students will acquire insight into the gendered division of labour and its relation to politics and economics. • Men and women students and professionals will be better equipped to work and live together as equals. • Students will develop a sense of appreciation of women in all walks of life. • Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.
R20CSE2201	Discrete Mathematics	II YEAR II SEMESTER	<ul style="list-style-type: none"> • For a given logic sentence express it in terms of predicates, quantifiers, and logical connectives • For a given a problem, derive the solution using deductive logic and prove the solution based on logical inference • For a given a mathematical problem, classify its algebraic structure • Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra • Develop the given problem as graph networks and solve with techniques of graph theory.
R20ECE2102	Digital Logic	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Interpret the various number systems & code converters, error detecting and

	Design		<p>correcting, BCD, Gray Code, EX-3.</p> <ul style="list-style-type: none"> Describe the operation of logic gates and Apply Boolean Algebra on K-map. Design / Analysis of Combinational Circuits. Diagram illustrates the operation & timing constraints for Latches & Flip-Flops and Registers and Counters. Design & analyze sequential circuits. Use HDL & appropriate EDA tools for digital logic design & simulation.
R20CSE2202	Operating Systems	II YEAR II SEMESTER	<ul style="list-style-type: none"> Apply optimization techniques for the improvement of system performance. Ability to understand the synchronous and asynchronous communication mechanisms in their respective OS. Learn about minimization of turnaround time, waiting time and response time and also maximization of throughput with keeping CPU as busy as possible. Ability to compare the different OS
R20CSE2203	Database Management Systems	II YEAR II SEMESTER	<ul style="list-style-type: none"> Demonstrate the basic elements of a relational database management system. Ability to identify the data models for relevant problems. Ability to design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data. Apply normalization for the development of application software's
R20CSE2204	Java Programming	II YEAR II SEMESTER	<ul style="list-style-type: none"> Understanding of OOP concepts and basics of java programming (Console and GUI based) The skills to apply OOP and Java programming in problem solving. Should have the ability to extend his/her knowledge of Java programming further on his/her own.
R20CSE22L1	Operating Systems Lab	II YEAR II SEMESTER	<ul style="list-style-type: none"> The course objectives ensure the development of students applied skills in operating systems related areas. Students Williams knowledge in writing Software routines Modules or implementing various concepts of Operating system
R20CSE22L2	Database Management Systems Lab	II YEAR II SEMESTER	<ul style="list-style-type: none"> Ability to design and implement a database schema for given problem. Be capable to Design and build a GUI application. Apply the normalization techniques for development of application software to realistic problems. Ability to formulate queries using SQL DML/DDDL/DCL commands.
R20CSE22L3	Java Programming Lab	II YEAR II SEMESTER	<ul style="list-style-type: none"> Basics of java programming, multi-threaded programs and Exception handling. The skills to apply OOP in Java programming in problem solving.

			<ul style="list-style-type: none">• Ability to access data from a DB with Java programs.• Use of GUI components (Console and GUI based).
R20MAC2200	Intellectual Property Rights	II YEAR II SEMESTER	<ul style="list-style-type: none">• Intellectual property right, Deborah. E. Bouchoux, Cengage learning.• Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tate McGraw Hill Publishing company ltd.,

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INTERNET of THINGS (IoT)
(BR20)

PROGRAM OUTCOMES (POs)

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

COURSE OUTCOMES (COs)

Course Code	Course Name	Year / Semester	Course Outcomes
R20ECE2106	Analog and Digital Electronics	II Year / I Semester	<ul style="list-style-type: none"> • Know the characteristics of various components. • Understand the utilization of components. • Design and analyze small signal amplifier circuits. • Learn Postulates of Boolean algebra and to minimize combinational functions • Design and analyze combinational and sequential circuits • Know about the logic families and realization of logic gates.
R20CSE2101	Data Structures	II Year / I Semester	<ul style="list-style-type: none"> • Ability to select the data structures that efficiently model the information in a problem. • Ability to assess efficiency trade-offs among different data structure implementations or combinations. • Implement and know the application of algorithms for sorting and pattern matching. • Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.
R20MTH2103	Probability & Statistical Methods	II Year / I Semester	<ul style="list-style-type: none"> • Apply the concepts of probability and distributions to some case studies • Correlate the material of one unit to the material in other units • Resolve the potential misconceptions and hazards in each topic of study.
R20CSE2201	Discrete Mathematics	II Year / I Semester	<ul style="list-style-type: none"> • Ability to understand and construct precise mathematical proofs • Ability to use logic and set theory to formulate precise statements • Ability to analyze and solve counting problems on finite and discrete structures • Ability to describe and manipulate sequences • Ability to apply graph theory in solving computing problems
R20CSE2104	Python Programming	II Year / I Semester	<ul style="list-style-type: none"> • Examine Python syntax and semantics and be fluent in the use of Python flow control and functions. • Demonstrate proficiency in handling Strings and File Systems. • Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.

			<ul style="list-style-type: none"> • Interpret the concepts of Object-Oriented Programming as used in Python. • Implement exemplary applications related to Network Programming, Web Services and Databases in Python.
R20ECE21L5	Analog and Digital Electronics Lab	II Year / I Semester	<ul style="list-style-type: none"> • Know the characteristics of various components. • Understand the utilization of components. • Design and analyze small signal amplifier circuits. • Postulates of Boolean algebra and to minimize combinational functions • Design and analyze combinational and sequential circuits • Known about the logic families and realization of logic gates.
R20CSE21L1	Data Structures Lab	II Year / I Semester	<ul style="list-style-type: none"> • Ability to develop C programs for computing and real-life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists. • Ability to Implement searching and sorting algorithms
R20CSE21L2	IT Workshop Lab	II Year / I Semester	
R20CSE21L4	Python Programming Lab	II Year / I Semester	<ul style="list-style-type: none"> • Student should be able to understand the basic concepts scripting and the contributions of scripting language • Ability to explore python especially the object-oriented concepts, and the built in objects of Python. • Ability to create practical and contemporary applications such as TCP/IP network programming, Web applications, discrete event simulations
R20MAC2100	Gender Sensitization Lab (An Activity-based Course)	II Year / I Semester	<ul style="list-style-type: none"> • Students will have developed a better understanding of important issues related to gender in contemporary India. • Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film. • Students will attain a finer grasp of how gender discrimination works in our society and how to counter it. • Students will acquire insight into the gendered division of labour and its relation to politics and economics.

			<ul style="list-style-type: none"> • Men and women students and professionals will be better equipped to work and live together as equals. • Students will develop a sense of appreciation of women in all walks of life. • Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.
R20CSE2102	Computer Organization & Architecture	II Year / II Semester	<ul style="list-style-type: none"> • Understand the basics of instructions sets and their impact on processor design. • Demonstrate an understanding of the design of the functional units of a digital computer system. • Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory. • Design a pipeline for consistent execution of instructions with minimum hazards. • Recognize and manipulate representations of numbers stored in digital computers
R20MBA2201	Business Economics & Financial Analysis	II Year / II Semester	
R20CSE2202	Operating Systems	II Year / II Semester	<ul style="list-style-type: none"> • Will be able to control access to a computer and the files that may be shared • Demonstrate the knowledge of the components of computer and their respective roles in computing. • Ability to recognize and resolve user problems with standard operating environments. • Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.
R20CSE2205	Computer Networks	II Year / II Semester	<ul style="list-style-type: none"> • Gain the knowledge of the basic computer network technology. • Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model. • Obtain the skills of subnetting and routing mechanisms. • Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation.

R20CSE2204	Java Programming	II Year / II Semester	<ul style="list-style-type: none"> • Able to solve real world problems using OOP techniques. • Able to understand the use of abstract classes. • Able to solve problems using java collection framework and I/o classes. • Able to develop multithreaded applications with synchronization. • Able to develop applets for web applications. • Able to design GUI based applications
R20CSE22L1	Operating Systems Lab	II Year / II Semester	<ul style="list-style-type: none"> • Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management. • Able to implement C programs using Unix system calls
R20CSE22L4	Computer Networks Lab	II Year / II Semester	<ul style="list-style-type: none"> • Implement data link layer framing methods. • Analyze error detection and error correction codes. • Implement and analyze routing and congestion issues in network design. • Implement Encoding and Decoding techniques used in presentation layer. • To be able to work with different network tools.
R20CSE22L3	Java Programming Lab	II Year / II Semester	<ul style="list-style-type: none"> • Able to write programs for solving real world problems using java collection frame work. • Able to write programs using abstract classes. • Able to write multithreaded programs. • Able to write GUI programs using swing controls in Java.
R20MAC2200	Intellectual Property Rights	II Year / II Semester	<ul style="list-style-type: none"> • Intellectual property right, Deborah. E. Bouchoux, Cengage learning. • Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tate McGraw Hill Publishing company ltd.,

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INFORMATION TECHNOLOGY
(BR20)

PROGRAM OUTCOMES (POs)

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

COURSE OUTCOMES (COs)

Course Code	Course Name	Year / Semester	Course Outcomes
R20ECE2105	Analog Electronics	II YEAR I SEMESTER	<ul style="list-style-type: none"> Describe the construction, operation and characteristics of electronic devices like P-N- Junction and special Purpose diodes (Understand). Determine the application of diode as a rectifier (Apply) Illustrate the application of transistors as amplifier employing BJT devices (Apply) Analyze the Biasing circuits using BJT Transistor Amplifier Circuit (Analyze) Evaluate construction, operation and characteristics of FET (Evaluate) Select Biasing circuits using FET Amplifiers (Analyze)
R20CSE2101	Data Structures	II YEAR I SEMESTER	<ul style="list-style-type: none"> Ability to select the data structures that efficiently model the information in a problem(Understand) Ability to assess efficiency trade-offs among different data structure implementations or combinations(Create) Implement and know the application of algorithms for sorting and searching(Create) Design a Program using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs and AVL-trees(Create) Ability to select the data structures that efficiently model the information in a problem(Analyze) Illustrate the concept of Text pattern matching algorithm(Analyze)
R20MTH2102	Computer Oriented Statistical Methods	II YEAR I SEMESTER	<ul style="list-style-type: none"> Apply the concepts of probability and distributions to some case studies Correlate the material of one unit to the material in other units Resolve the potential misconceptions and hazards in each topic of study. Solve problems on theory of probability, linear programming problems, and transportation, assignment and game problems. Learn important theorems, different formulae and practical applications of these statistical and optimization methods in the field of

			<p>Computer Sciences and Applications.</p> <ul style="list-style-type: none"> • learn fundamentals and concepts of statistical and optimization methods, in particular, with reference to frequency distribution and measures of central tendency, measures of dispersion, skewness and kurtosis
R20CSE2102	Computer Organization & Architecture	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Compare the architectures of different computers. • Identify different hardware components associated with the memory organization of a computer • Evaluation of address of an operand by using various addressing modes. • Summarizes the memory organization • Describe the architecture of 8086 microprocessor. • Design and implement simple systems using 8086 processor with the knowledge of pin diagram, registers and instruction formats of 8086 processor by writing assembly language programs.
R20CSE2103	Object Oriented Programming using C++	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Distinguish the procedural and object oriented paradigm along with principles(Analyze) • Understand dynamic memory management techniques using pointers, constructors, destructors, etc (Understand) • Describe the concept of function overloading, operator overloading, virtual functions and polymorphism.(Understanding) • Classify inheritance with the understanding of early and late binding (Understand) • Illustrate the process of data file manipulations using C++ (Apply) • An ability to incorporate Exception handling in Object Oriented programs(Analyze)
R20ECE21L4	Analog Electronics Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Determine the P-N-Junction diode & Zener diode characteristics.(Evaluate) • Calculate the Input and Output characteristics of BJT and FET. (Evaluate) • Evaluate Half Wave and Full Wave Rectifier with and without filters. (Evaluate) • Differentiate Measurement of h-parameters of transistor in CB, CE, CC configurations.(Analyze) • Analyze the Frequency response of CE, CC and Common Source FET Amplifier

			<p>.(Analyze)</p> <ul style="list-style-type: none"> • Measure SCR and UJT characteristics.
R20CSE21L1	Data Structures Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Design a program to implement the linear data structures using static and dynamic memory allocation. (Create)) • Design a program to implement searching ,sorting techniques for the given problem.(Create) • Demonstrate the fundamental algorithms of tree data structures by experimenting the programs.(Apply) • Examine the traversing of a given graph by using the respect to graph traversal techniques(Apply) • Design a program to implement the pattern matching algorithms for the given problem.(Create)
R20CSE21L2	IT Workshop Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • Distinguish software's and their installation.(Analyzing) • Design word documents by learning word processing.(Creating) • Create presentations by using different styles.(Create) • Introduce different way of hooking the PC on to the internet from home and workplace and effectively usage of the internet(Analyzing) • Define usage of web browsers, email, news groups and discussion forums would be covered(Remembering) • List of tools & modules would enable the students in crafting professional word document.(Remembering)
R20CSE21L3	C++ Programming Lab	II YEAR I SEMESTER	<ul style="list-style-type: none"> • develop applications for a range of problems using object-oriented programming (Create) • Demonstrate the implementation of constructors, destructors and operator overloading. (Apply) • Apply virtual and pure virtual function & complex program situations(Apply) • Apply fundamental algorithmic problems including type casting, inheritance, and polymorphism. (Apply) • Explain generic programming, templates, file handling. (Understand) • Handle exceptions in programming (Analyze)
R20MAC2100	Gender	II YEAR I	<ul style="list-style-type: none"> • Develop a better understanding of important

	Sensitization Lab	SEMESTER	<p>issues related to gender in contemporary India.(Applying)</p> <ul style="list-style-type: none"> • Sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.(Remembering) • Attain a finer grasp of how gender discrimination works in our society and how to counter it.(Remembering) • explain insight into the gendered division of labor and its relation to politics and economics.(Understanding) • Men and women students and professionals will be better equipped to work and live together as equals.(Understanding) • develop a sense of appreciation of women in all walks of life.(Applying)
R20CSE2201	Discrete Mathematics	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Express it in terms of predicates, quantifiers, and logical connectives(Remembering) • Derive the solution for a problem using deductive logic and prove the solution based on logical inference(Remembering) • Classify its algebraic structure for a given mathematical problem.(Understanding) • Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra(Evaluate) • Develop the given problem as graph networks and solve with techniques of graph theory(Apply) • Describe logical reasoning to solve a variety of problems.(Understanding)
R20ECE2102	Digital Logic Design	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Interpret the various number systems & code converters, error detecting and correcting, BCD, Gray Code, EX-3. (Evaluate) • Describe the operation of logic gates and Apply Boolean Algebra on K-map. (Understanding) • Design / Analysis of Combinational Circuits. (Create) • Diagram illustrates the operation & timing constraints for Latches & Flip-Flops and Registers and Counters.(Understanding) • Design & analyze sequential circuits. (Create)

			<ul style="list-style-type: none"> • Use HDL & appropriate EDA tools for digital logic design & simulation. (Understanding)
R20CSE2202	Operating Systems	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Apply different techniques for the improvement of system performance, ability to compare different operating systems (applying) • Explain the minimization of turnaround time, waiting time, response time and also maximization of throughput (understanding) • Describe the concept of memory management including virtual memory, compare various page replacement algorithms, internal and external fragmentation of memory. (understanding) • Illustrate file management, analysis different file allocation strategies, describing the structure of mass storage devices and develop disk scheduling algorithm (applying) • Evaluate the problems related to deadlocks, avoiding the deadlocks, detecting the deadlocks and deadlock prevention algorithm. (evaluating) • Analyze system protection and revocation of access rights (analyzing)
R20CSE2203	Database Management Systems	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Demonstrate the basic elements of a relational database management system. (understanding) • Identify the data models for relevant problems. (applying) • Design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data. (creating) • Apply normalization for the development of application software's (applying) • Analyze the basic SQL AND PL/SQL Queries (analyzing) • Justify the basic issues of transaction processing and concurrency control. (evaluating)
R20CSE2204	Java Programming	II YEAR II SEMESTER	<ul style="list-style-type: none"> • Define the basic concepts of java programming (Remember K1) • Understand the oops concepts in java programming (Understand K2) • Implement error handling and multithreading concepts for multiprocessing (Apply K3) • Analyze the concepts for storage of data using files and connecting to

			<p>database.(Analyze K4)</p> <ul style="list-style-type: none"> Evaluating techniques for developing of forms using GUI programming (Evaluate K5) Designing of different applications(Create K6)
R20CSE22L1	Operating Systems Lab	II YEAR II SEMESTER	<ul style="list-style-type: none"> Examine various CPU scheduling algorithms to identify the best scheduling algorithm as per software requirement. (K3- Apply) Justify the various page replacement algorithms in memory management to assess the effective memory utilization.(K5-Evaluate) Experiment the paging and segmentation concepts for memory management.(K3-Apply) Develop the File Allocation and File Organization Techniques. (K6-Create) Generate the resource-allocation graph for dead lock detection. (K6-Create) Compose the Banker's Algorithm for implementing the dead lock avoidance concept. (K6-Create)
R20CSE22L2	Database Management Systems Lab	II YEAR II SEMESTER	<ul style="list-style-type: none"> Explain the basic requirements i.e. entities, attributes etc. for developing an enterprise database.(Understand K2) Illustrate the relationship among the entities and attributes with the help of E-R model for the given enterprise database design. (Apply K3) Assess the key constraints on the given entities of an enterprise database for performing efficient manipulations on them.(Evaluate K5) Apply the normalization techniques among the entities for handling various anomalies. (Apply K3) Experiment the various DML and DDL commands for the specified enterprise database. (Apply K3) Build queries to perform various manipulations on the given enterprise database for generating different reports.(Create K6)
R20CSE22L3	Java Programming Lab	II YEAR II SEMESTER	<ul style="list-style-type: none"> Recall the basic concepts of java programming (Remembering K1). Translate the given user requirement into the program format using java compiler and eclipse platform (Understanding K2). Implement multithreading with n threads for multiprocessing and handle exception using exception handling techniques (Applying K3). Analyze the concepts for storage of data

			<p>using files and connecting to database using JDBC (Analyzing K4).</p> <ul style="list-style-type: none"> Evaluating techniques for developing of forms using GUI programming and different layouts (Evaluating K5). Construct an application that prints meta-data of a given table (Creating K6).
R20MAC2200	Intellectual Property Rights	II YEAR II SEMESTER	<ul style="list-style-type: none"> Define intellectual property rights(Remembering) Describe the functions of trade marks(understanding) Apply law of copyrights(applying) Develop procedural knowledge to legal systems (apply) Solve the problem relating to intellectual property rights(create) Compare and contrast the different terms of intellectual property protection in terms of the key differences and similarities(analyzing)
R20MBA2201	Business Economics & Financial Analysis	III YEAR I SEMESTER	<ul style="list-style-type: none"> Describe the market dynamics namely, demand and supply, demand forecasting, elasticity of demand and supply, pricing methods and pricing in different market structures.(Understanding) Gain an insight into how production function is carried out to achieve least cost combination of inputs and cost analysis.(Remembering) Develop an understanding of markets and new economic environment(Analyzing) Analyze how capital budgeting decisions are carried out.(Create) explain the framework for both manual and computerized accounting process(Understanding) Know how to analyze and interpret the financial statements through ratio analysis.(Analyzing)
R20CSE3102	Software Engineering	III YEAR I SEMESTER	<ul style="list-style-type: none"> Analyze the knowledge of Software Engineering principles of large scale software systems, and the process models that are used to build them.(Analyzing) Differentiate the functional and non-functional requirements, user and system requirements with respect to preparing the SRS document and perform feasibility study, validation of the gathered requirements.(Understanding)

			<ul style="list-style-type: none"> • Illustrate various system models with respect to the nature of software to be developed. • Design software architecture for the specified application or problem.(Create) • Develop and apply testing strategies for software applications.(Create) • Evaluate Quality control and how to ensure good quality software(Evaluate)
R20INF3101	Data Communication & Computer Networks	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Describe the seven layers of OSI Protocol hierarchy(Remembering) • Differentiate wireless communication satellite and cellular radio satellite(Analyzing) • Define cradles telephone , basic telephone procedures and standard telephone set (Remembering) • explain the terminology and concepts of the OSI reference model and the TCP-IP reference model.(Understanding) • Describe various networking concepts.(Understanding) • Illustrate various Internet Transport Protocols.(Understanding)
R20INF3102	Web Programming	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Describe PHP and PHP utilities for server side scripting(Understanding) • Implement the XML programme using PARSING METHODS(Create) • Justify Server side programming with Java SERVLET'S and JSP(Evaluating) • Develop the JSP page and connecting to Data Base(Create) • Discuss about java script with declaration of variables and functions(Create) • Develop a college web site using PHP(Create)
Professional Elective-I			
R20CSE3111	Advanced Computer Architecture	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Evaluate Performance Of Different Architectures With Respect To Various Parameters(Evaluating) • Analyze Performance Of Different ILP Techniques(Analyzing) • Identify Cache and Memory Related Issues in Multi-Processors Possess the skill for representing knowledge using the appropriate technique.(Applying) • describe the design issues relating to the architectural options(Understanding) • describe the challenges faced in the implementation of these high performance

			<p>system(Understanding)</p> <ul style="list-style-type: none"> Identify, assess contemporary practical examples and con temporary application areas.(Applying)
R20CSE3101	Formal Languages & Automata Theory	III YEAR I SEMESTER	<ul style="list-style-type: none"> Design finite automata to accept a set of strings of a language.(Create) Prove that a given language is regular and apply the closure properties of languages.(Evaluating) Design context free grammars to generate strings from a context free language and convert them into normal forms.(Create) Prove equivalence of languages accepted by Push Down Automata and languages generated by context free grammars Identify the hierarchy of formal languages, grammars and machines.(Applying) Distinguish between computability and non-computability and Decidability and Undesirability. (Analyzing)
R20CSE3113	Principles of Programming Languages	III YEAR I SEMESTER	<ul style="list-style-type: none"> Define the syntax-related concepts including context-free grammars, parse trees, recursive-descent parsing, and interpretation(Remember K1) Illustrate the semantic issues associated with implementations, including variable binding, scoping rules, Expression and Assignment statement and control structures.(Apply K3) Justify the language abstraction constructs of functions, parameter passing and co routines.(Evaluate K5) Classify the Abstract Data Types, concurrency and Exception handling in various programming languages.(Analyze K4) Describe the implementation of Functional programming languages and scripting languages.(Understand K2) Describe the implementation model of logic programming language.(Understand K2)
Professional Elective –II			
R20CSE3121	Advanced Operating Systems	III YEAR I SEMESTER	
R20CSE3122	Artificial Intelligence	III YEAR I SEMESTER	<ul style="list-style-type: none"> Formulate an efficient problem space for a problem expressed in English.(Creating) select a search algorithm for a problem and characterize its time and space complexities.(Apply)

			<ul style="list-style-type: none"> • Build skill for representing knowledge using the appropriate technique. (Applying) • apply AI techniques to solve problems of Game Playing, Expert Systems, Machine Learning and Natural Language Processing.(Applying) • define machine learning paradigms(Remembering) • show the knowledge of case grammars semantic web(Remembering)
R20INF3122	Computer Graphics	III YEAR I SEMESTER	<ul style="list-style-type: none"> • List the basic concepts used in computer graphics(Remembering) • Implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping. (Create) • Describe the importance of viewing and projections.(Remembering) • Define the fundamentals of animation, virtual reality and its related technologies. (Remembering) • describe a typical graphics pipeline (Understanding) • Design an application with the principles of virtual reality(Create)
R20CSE31L1	Software Engineering Lab	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Design document, test cases and software configuration management and risk management related document.(Create) • Develop function oriented and object oriented software design using tools like rational rose.(Applying) • Perform unit testing and integration testing.(Applying) • Apply various white box and black box testing techniques(Applying) • Track the progress of a project using Open project tool.(Evaluate) • build test cases for software testing(Applying)
R20INF31L1	Computer Networks & Web Programming Lab	III YEAR I SEMESTER	<ul style="list-style-type: none"> • Design a web page using PHP.(Create) • Develop an XML Program using DOM & SAX.(Applying) • Evaluate the Server side programming with Java Servlets(Evaluate) • Implement farming methods(Understand) • Analyze Distance Vector Routing algorithm for finding shortest path(Analyze)

			<ul style="list-style-type: none"> Analyze various Error Detection And Error correction methods(Analyze)
R20HAS31L1	Advanced Communication Skills Lab	III YEAR I SEMESTER	<ul style="list-style-type: none"> explain effectively in formal and informal situations.(k2-Understand) describes wide range of vocabulary and enable them to use language more effectively.(k1-Remember) explain the strategies of the interviewers to facilitate better responses during ‘Placement’ interviews.(k2-Understand) identify areas of evaluation in GDs conducted by organizations as part of the selection procedure.(k5-Evaluate) Equip with pre-presentation steps, to understand the structure of a good presentation, and devise various techniques for illustrating a successful presentation. (k3-Apply) Overcome stage fear and analyze the questions. (k4-Analyze)
R20CSE3201	Machine Learning	III YEAR II SEMESTER	<ul style="list-style-type: none"> Identify the characteristics of datasets and compare the trivial data and big data for various applications(Applying) describe machine learning techniques and computing environment that are suitable for the applications under consideration(Understanding) Solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues(Applying) Develop scaling up machine learning techniques and associated computing techniques and technologies for various applications(Applying) Implement various ways of selecting suitable model parameters for different machine learning techniques(Create) Define Integrate machine learning libraries, and mathematical and statistical tools with modern technologies like Hadoop distributed file system and MapReduce programming model(Remembering)
R20INF3201	Principles of Compiler Construction	III YEAR II SEMESTER	<ul style="list-style-type: none"> Classify the finite state machines and the languages accepted by them. (K4-Analyze) Demonstrate the working of Top-Down and Bottom-Up Parsers. (K3-Apply) Describe the semantics, hierarchy and type

			<p>checking of the grammars and languages.(K2-Understanding)</p> <ul style="list-style-type: none"> Assess the importance of code optimization on the given code at various levels of the compilation.(K5-Evaluate) Justify the output generated by the code generator phase of the compiler with the help of object code forms and code generation algorithms.(K5-Evaluate) Generate the LL (K) and LR(K) parsers for parsing the given set of input data.(K6-Create)
R20INF3202	Algorithm Design and Analysis	III YEAR II SEMESTER	<ul style="list-style-type: none"> Analyzing the algorithms and improve the efficiency of algorithms(Analyze) different designing methods for development of algorithms to realistic problems(Apply K3) Describe and estimate the performance of algorithms(Understand K2) Evaluate the problems by using Greedy method and Dynamic programming approach on various applications.(Evaluate K5) Evaluate the problems by using backtracking, branch and bound on various applications.(Evaluate K5) Evaluate the problems of deterministic and nondeterministic polynomial (Evaluate K5)
Professional Elective –III			
R20CSE3231	Software Testing Methodologies	III YEAR II SEMESTER	<ul style="list-style-type: none"> Describe the basic concepts of software testing and its essentials and to identify the various bugs and correcting them after knowing the consequences of the bug. (k2-Understand) Define program's control flow as a structural model is the corner stone of testing and performing functional testing using control flow and transaction flow graphs. (k1-remember) Determine test domain or an application of software environment.(k3-Apply) Explain the functional and system testing methods.(k2-Understand) Evaluate functional testing using control flow and transaction flow graphs.(k5-Evaluate) <p>Develop and apply testing strategies for software applications (k6-Create).</p>
R20CSE3232	Scripting Languages	III YEAR II	<ul style="list-style-type: none"> Analyze requirements of software systems for the purpose of determining the suitability

		SEMESTER	<p>of implementing in Perl or Python;(Analyze)</p> <ul style="list-style-type: none"> Analyze and model requirements and constraints for the purpose of designing(Analyze) implement software systems in Perl and Python;(Create) Evaluate and compare designs of such systems on the basis of specific requirements and constraints.(Evaluate) Analyze problems and synthesize suitable solutions. Specifically: (Analyze) Design and implement Perl and Python software solutions that accommodate specified requirements and constraints analysis or modeling or requirements specification.(Create)
R20CSE3233	Mobile Application Development	III YEAR II SEMESTER	<ul style="list-style-type: none"> Discuss the mobile devices and mobile platforms.(K2-Understanding) Analyze wireless communications standards and data transmission standards.(K4-Analyzing) Illustrate and setup a mobile device and application runtime environment.(K3-Applying) setup programming tools for a mobile application developer (for selected modern mobile platforms) (K6-Creating) Describe the need for continuous improvement of his/her skills due to the rapidly changing environment of mobile devices.(K2-Understanding) Explain the basic connections of generic framework.(K2-Understanding)
R20CSE32L1	Machine Learning Lab	III YEAR II SEMESTER	<ul style="list-style-type: none"> Describe the implementation procedures for the machine learning algorithms. (Understanding) Design java/python programs for various learning algorithms(Create) Apply appropriate data sets to the machine learning algorithms(Apply) Identify and apply machine learning algorithms to solve real world problems(Applying) Select appropriate data set for experiment and draw graphs(Apply) Define data sets (Remembering)
R20INF32L1	Compiler Construction Lab	III YEAR II SEMESTER	<ul style="list-style-type: none"> Examine the role of lexical analyzer on the given input data(Analyze) Construct Recursive Descent Parser for the given grammar(Apply) Experiment the functionality of non-recursive descent parser(LL(1) by parsing the given input string(Evaluate)

			<ul style="list-style-type: none"> • Build the intermediate code from the given source code by using various intermediate code generation techniques(Apply) • Generate the machine code from the given abstract syntax tree of the source code(Create) • Justify the functionality of lexical analyser using LEX, FLEX or JFLEX tool (Evaluating)
R20CSE32L3	Professional Elective-III Software Testing Methodologies Lab	III YEAR II SEMESTER	<ul style="list-style-type: none"> • Define s/w debugging methods (Remembering) • Apply WBT & BBT methods and techniques (Applying) • Define test plans (Understanding) • Make use of open source tools (Remembering) • Describe quality assurance models (Remembering) • Develop a test plan document(Create)
R20INF4101	Information Security	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Explain security concepts, Ethics in Network Security. Identify and classify various Attacks and explain the same.(K2-Understanding, K1-Remembering) • Compare and contrast symmetric and asymmetric encryption systems and their vulnerability to various attacks.(K5-Evaluating) • Explain the role of third-party agents in the provision of authentication services.(K2-Understand) • Comprehend and apply authentication, email security, web security services and mechanisms.(K3-Applying) • Distinguish and generate different protocol like SSL, TLS Vis-à-vis their applications.(K6-Createing) • Categorize the effectiveness of passwords in access control and Explain firewall principles.(K4-Analyzeing, K2-Understanding)
R20CSE4102	Data Mining	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Design a data mart or data warehouse for any organization(Create) • solve raw input data and preprocess it to provide suitable input for range of data mining algorithms(Create) • apply association rules and classification model(Applying)

			<ul style="list-style-type: none"> Identify the similar objects using clustering techniques(Applying) Explore recent trends in data mining such as web mining, spatial-temporal mining(Understanding) Identify business applications of data mining(Applying)
Professional Elective –IV			
R20INF4142	Pattern Recognition	IV YEAR I SEMESTER	<ul style="list-style-type: none"> Design systems and algorithms for pattern recognition (signal classification), with focus on sequences of patterns that are analyzed using, e.g., hidden Markov models (HMM), (Creating) Analyze classification problems probabilistically and estimate classifier performance,(Analyzing) Explain and analyze methods for automatic training of classification systems, (Understanding) Apply Maximum-likelihood parameter estimation in relatively complex probabilistic models, (Applying) Explain about mixture density models and hidden Markov models,(Understanding) Explain the principles of Bayesian parameter estimation and apply them in relatively simple probabilistic models(Understanding)
R20CSE4143	Cloud Computing	IV YEAR I SEMESTER	<ul style="list-style-type: none"> Implement knowledge of latest Technologies and how to create virtual machines in a single physical device(k1Apply) Develop virtual machines by using hypervisor software.(k6-Create) Execute migration techniques and virtual machines can be migrated from one host to another host(k5-Evaluate) Describe the Cloud Services like IAAS, PAAS, SAAS and Distributed Data Storage in Cloud(k2-Understand) Demonstrate Monitoring and Management and Applications and SLA Management and Understand the AWS console create the S3 registration and creating buckets in the S3 Cloud(k3-Apply) Master systemSupport different hardware components related with Distributed Cloud and best Practices in Architecting Cloud

			Applications in the AWS Cloud(k5-Evaluate)
R20INF4141	Ad hoc Sensor Networks	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Understand the concepts of Ad-hoc and Sensor networks (Understand) • Demonstrate the data transmission and usage of protocols in ad-hoc sensor networks.(Apply) • Analyze the design issues and data retrieval scenarios in ad-hoc sensor networks.(Analyze) • Describe the security issues, key management and intrusion detection system in ad-hoc sensor networks.(Remember) • Explain about various operating systems related to ad-hoc sensor networks.(Understand) • Justify the dataflow style in various languages(Evaluate)
Professional Elective –V			
R20CSE4152	Internet of Things	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • explain the vision of IOT from a global context. (Understanding) • Determine the Market perspective of IOT. (Evaluate) • Use of Devices, Gateways and Data Management in IOT. (Apply) • Construct state of the art architecture in IOT.(Create) • Design some IOT based prototypes (Create) • Apply effective techniques to create IOT based projects(Apply)
R20CSE3123	Distributed Databases	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Explain the techniques used for data fragmentation, replication, and allocation during the distributed database design process.(Understanding) • Explain theoretical and practical aspects of distributed database systems.(Understanding) • Study and identify various issues related to the development of distributed database system.(Applying) • Describe the design aspects of object oriented database system and related development.(Understanding) • Evaluate simple strategies for executing a distributed query to select the strategy that minimizes the amount of data transfer(Evaluate) • Describe distributed concurrency control based on the distinguished copy techniques

			and the voting methods.(Remembering)
R20CSE4153	Software Process & Project Management	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • Describe software process maturity framework. (Understanding) • Explain conventional software management and software economics. (Understanding) • Discuss software projects and project planning. (Creating) • Analyze project tracking and control.(Analyzing) • Assess the role of project closure analysis (Evaluating) • Evaluate, manage, and design processes (Evaluating)
R20INF41L1	Information Security Lab	IV YEAR I SEMESTER	<ul style="list-style-type: none"> • To summarize master information security governance, and related legal and regulatory issues(Understanding) • .To be familiar with how threats to an organization are discovered, analyzed, (Remembering) • To be familiar with network security threats and countermeasures(Remembering) • To be familiar with network security designs using available secure solutions (such as PGP,SSL, IPsec, etc).(Creating) • To be familiar with advanced security issues and technologies (such as DoS attack detection and containment, and anonymous communication(Evaluating) • compare and contrast symmetric and asymmetric encryption systems and their vulnerability to attack, and explain the characteristics of hybrid systems.(Analyzing)
R20HAS4201	Organizational Behaviour	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Explain the organizational behavioral challenges in the Canadian work environment.(Understanding) • Illustrate the impact of perception, personality and emotions. .(Understanding) • Articulate the impact of values, attitudes and the influence of diversity. .(Understanding) • Describe the major motivational theories that affect the workplace. (Remembering) • Discuss the difference between work groups and work teams and the models of team development.(Creating) • Summarize the communication channels and their barriers. (Understanding)

Professional Elective –VI

R20CSE4261	Distributed Systems	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Explain various architectures used to design distributed systems, such as client-server and peer-to-peer. (Understanding) • Build distributed systems using various inter-process communication techniques, such as remote method invocation, remote events, and tuple spaces. (Creating) • Build distributed systems using various techniques for tolerating partial failures, such as leasing and replication. (Creating) • Build distributed systems using various inter-process coordination techniques, such as distributed mutual exclusion, distributed monitors, and tuple spaces. (Creating) • Explain various distributed algorithms, such as logical clocks and leader election. . (Understanding) • Analyze and explain current distributed systems research literature. (Analyzing)
R20CSE4262	Cyber Forensics	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Discuss the security issues network layer and transport layer. • Apply security principles in the application layer. • Explain computer forensics. • Use forensics tools. • Analyze and validate forensics data.
R20CSE4263	Human Computer Interaction	IV YEAR II SEMESTER	<ul style="list-style-type: none"> • Apply HCI and principles to interaction design.(Applying) • Design certain tools for blind or PH people. .(Creating) • Design effective HCI for individuals and persons with disabilities.(Creating) • Assess the importance of user feedback.(Evaluating) • Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.(Understanding) • Develop meaningful user interface.(Applying)

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Sheriguda(V), Ibrahimpatnam(M), R.R.Dist. – 501510



**M.Tech. - COMPUTER SCIENCE &
ENGINEERING
(BR20)**

COURSE OUTCOMES (COs)

Course Code	Course Name	Year / Semester	Course Outcome
R20CSE1501	Advanced Data Structures and Algorithms	I Year- I Semester	<ul style="list-style-type: none"> • Appreciate what solution to a computational problem efficient or inefficient Compare between different data structures. Pick an appropriate data structure for a design situation. • Analyse the efficiency of advanced algorithmic techniques e.g., approximation(randomized and LP-based rounding etc), randomization algorithms (expected running time, probability of error). • Identify and apply design principles for the design of advanced efficient algorithms • Understand some pieces of current research on algorithms.
R20CSE1502	Computer Networking	I Year- I Semester	<ul style="list-style-type: none"> • Concepts of some selected topics in computer network, issues involved in network design, familiar with some advanced topics and emerging type of network design concepts. • Ability to design and analyze some of the protocols behaviour
R20CSE1503	Advanced Operating Systems	I Year- I Semester	<ul style="list-style-type: none"> • Concepts of some of the advanced topics in operating system design, issues involved in memory, concurrency, and file management techniques, familiar with some advanced topics and emerging type of operating system design concepts. • Ability to design and analyze mobile OS based applications and to customize kernel tuning.
R20CSE1504	Artificial Intelligence	I Year- I Semester	<ul style="list-style-type: none"> • Solve basic AI based problems. • Define the concept of Artificial Intelligence. • Apply AI techniques to real-world problems to develop intelligent systems. • Select appropriately from a range of techniques when implementing intelligent systems.
R20CSE1505	Software Process and Project Management	I Year- I Semester	<ul style="list-style-type: none"> • Apply project management concepts and techniques to an IT project. • Identify issues that could lead to IT project success or failure. • Explain project management in terms of the software development process. • Describe the responsibilities of IT project managers. • Apply project management concepts through

			working in a group as team leader or active team member on an IT project.
R20CSE1506	Natural Language Processing	I Year- I Semester	<ul style="list-style-type: none"> • Understand concept of natural language processing. • Understand various research issues in natural language processing. • Apply various tools and techniques in natural language processing.
R20CSE1507	Pattern Recognition	I Year- I Semester	<ul style="list-style-type: none"> • Understand the theory, benefits, inadequacies and possible applications of various machine learning and pattern recognition algorithms • Identify and employ suitable machine learning techniques in classification, pattern recognition, clustering and decision problems.
R20CSE1508	Graph Theory	I Year- I Semester	<ul style="list-style-type: none"> • Solve problems using basic graph theory • Identify induced subgraphs, cliques, matchings, covers in graphs • Determine whether graphs are Hamiltonian and/or Eulerian • Solve problems involving vertex and edge connectivity, planarity and crossing numbers • Solve problems involving vertex and edge coloring • Model real world problems using graph theory
R20CSE1509	Machine Learning	I Year- I Semester	<ul style="list-style-type: none"> • Develop an understanding what is involved in learning models from data. • Understand a wide variety of learning algorithms. • Apply principles and algorithms to evaluate models generated from data. • Apply the algorithms to a real-world problem.
R20CSE1510	Internet of Things	I Year- I Semester	<ul style="list-style-type: none"> • Solve basic network design problems of Internet of Things. • Define the concept of data communications protocols and convergence of technologies. • Understand the principles and various research issues related to Internet of Things.
R20CSE1511	Software Architecture and Design Patterns	I Year- I Semester	<ul style="list-style-type: none"> • Ability to add functionality to designs while minimizing complexity • Understand what design patterns really are, and are not • Learn specific design patterns. • Able to design patterns to keep code quality high without overdesign.
R20CSE1512	Embedded Systems	I Year- I Semester	<ul style="list-style-type: none"> • Ability to describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems.

			<ul style="list-style-type: none"> • Ability to design the real time embedded systems using the concepts of RTOS. • Ability to analyze various examples of embedded systems • Ability to develop programs in C/C++ for embedded systems.
R20CSE1601	Advanced Data Structures and Algorithms Lab	I Year- I Semester	<ul style="list-style-type: none"> • Ability to select the data structures that efficiently model the information in a problem. • Ability to assess efficiency trade-offs among different data structure implementations or combinations. • Implement and know the application of algorithms for sorting and pattern matching. • Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and B-trees.
R20CSE1513	Network Programming	I Year- II Semester	<ul style="list-style-type: none"> • Learn the basic set of commands and utilities in Linux/UNIX systems. • Originate file and directories in UNIX programming. • Devise the signals, Inter process communication systems. • Make use of socket to implement client/server environment. • Explore the Network Programming and RMI in detail.
R20CSE1514	Database System concepts	I Year- II Semester	<ul style="list-style-type: none"> • Apply various facets of relational databases and retrieve data for any application. • Document database structures and rules. • Describe the characteristics of Business databases and the features of database management systems. • Use basic administrative functions and security Administration to protect data integrity
R20CSE1515	Web Services and Service Oriented Architecture	I Year- II Semester	<ul style="list-style-type: none"> • Get the foundations and concepts of service based computing • Advocate the importance and means of technology alignment with business • Understanding the basic operational model of web services, • Gain the knowledge of key technologies in the service oriented computing arena • Apply and practice the learning through a real or illustrative project/case study.
R20CSE1516	Big Data Analytics	I Year- II Semester	<ul style="list-style-type: none"> • Ability to explain the foundations, definitions, and challenges of Big Data and various Analytical tools. • Ability to program using HADOOP and Map reduce, NOSQL

			<ul style="list-style-type: none"> • Ability to understand importance of Big Data in Social Media and Mining.
R20CSE1517	Advanced Data Mining	I Year- II Semester	<ul style="list-style-type: none"> • To understand the basic principles, concepts and applications of data warehousing and data mining. • Ability to do Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment. • Study applications and trends in data mining. • Have a good knowledge of the fundamental concepts and the recent trends in this field.
R20CSE1518	Storage Area Networks	I Year- II Semester	<ul style="list-style-type: none"> • Demonstrate In-depth knowledge/ Scholarship of knowledge in the area of storage area networks. • Engage in independent study to prepare an oral presentation to address latest topics on storage networks. • Prepare a technical document for the solutions for the storage area networks related proposed system. • Engage in critical analysis to arrive at a valid conclusion through theoretical approach to provide an alternate solution to an identified problem in the area of storage area networks. • Demonstrate In-depth knowledge/ Scholarship of knowledge in.
R20CSE1519	Android Application Development	I Year- II Semester	<ul style="list-style-type: none"> • Demonstrate the android features and create, develop using android • Demonstrate and Understanding anatomy of an Android application • Apply the android geo location based services • Illustrate the android wifi features and advance android development • Demonstrate the linux security and implement ADL interface
R20CSE1520	Bioinformatics	I Year- II Semester	<ul style="list-style-type: none"> • Explain the basic principles that underpin Bioinformatics analyses, and apply these principles when analyzing biological data; • Survey a selected field within Bioinformatics, synthesize information from primary literature, and coherently report your findings in a written document; • Analyze biological data using a variety of Bioinformatics tools; • Interpret correctly the outputs from tools used to analyses biological data and make meaningful predictions from these outputs
R20CSE1521	Semantic Web and Social Networks	I Year- II Semester	<ul style="list-style-type: none"> • Ability to understand and knowledge representation for the semantic web • Ability to create ontology

			<ul style="list-style-type: none"> • Ability to build a blogs and social networks • Understand the basics of Semantic Web and Social Networks. • Understand Electronic sources for network analysis and different Ontology languages. • Modeling and aggregating social network data. • Develop social-semantic applications. • Evaluate Web- based social network and Ontology.
R20CSE1522	Wireless Networks and Mobile Computing	I Year- II Semester	<ul style="list-style-type: none"> • Understand the principles of wireless communications. • Understand fundamentals of wireless networking • Understand cellular system design concepts. • Analyze various multiple access schemes used in wireless communication. • Understand wireless wide area networks and their performance analysis. • Demonstrate wireless local area networks and their specifications.
R20CSE1523	Distributed Systems and Cloud Computing	I Year- II Semester	<ul style="list-style-type: none"> • Ability to understand the virtualization and cloud computing concepts.
R20CSE1524	Game Theory	I Year- II Semester	<ul style="list-style-type: none"> • Solve strategic games between two and more agents in non-cooperative scenario. • Analyze and solve both simultaneous-moves and sequential-moves games. • Learn different methods to solve games.
R20CSE1603	Web Services Lab	I Year- II Semester	<ul style="list-style-type: none"> • Design and implement web services for single and multiuser applications. • Develop the responsive services using HTTP. • Implement the web based services for customer operations. • Deploy the web services with the database connectivity. • Apply the web based concepts in real time applications.

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M.Tech. - COMPUTER SCIENCE
(BR20)

COURSE OUTCOMES (COs)

Course Code	Course Name	Year / Semester	Course Outcomes
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			<ul style="list-style-type: none"> • Ability to design the real time embedded systems using the concepts of RTOS. • Ability to analyze various examples of embedded systems • Ability to develop programs in C/C++ for embedded systems.
R20CSE1601	Advanced Data Structures and Algorithms Lab	I Year- I Semester	<ul style="list-style-type: none"> • Ability to select the data structures that efficiently model the information in a problem. • Ability to assess efficiency trade-offs among different data structure implementations or combinations. • Implement and know the application of algorithms for sorting and pattern matching. • Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and B-trees.
R20CSE1513	Network Programming	I Year- II Semester	<ul style="list-style-type: none"> • Learn the basic set of commands and utilities in Linux/UNIX systems. • Originate file and directories in UNIX programming. • Devise the signals, Inter process communication systems. • Make use of socket to implement client/server environment. • Explore the Network Programming and RMI in detail.
R20CSE1514	Database System concepts	I Year- II Semester	<ul style="list-style-type: none"> • Apply various facets of relational databases and retrieve data for any application. • Document database structures and rules. • Describe the characteristics of Business databases and the features of database management systems. • Use basic administrative functions and security Administration to protect data integrity
R20CSE1515	Web Services and Service Oriented Architecture	I Year- II Semester	<ul style="list-style-type: none"> • Get the foundations and concepts of service based computing • Advocate the importance and means of technology alignment with business • Understanding the basic operational model of web services, • Gain the knowledge of key technologies in the service oriented computing arena • Apply and practice the learning through a real or illustrative project/case study.
R20CSE1516	Big Data Analytics	I Year- II Semester	<ul style="list-style-type: none"> • Ability to explain the foundations, definitions, and challenges of Big Data and various Analytical tools. • Ability to program using HADOOP and Map reduce, NOSQL

			<ul style="list-style-type: none"> • Ability to understand importance of Big Data in Social Media and Mining.
R20CSE1517	Advanced Data Mining	I Year- II Semester	<ul style="list-style-type: none"> • To understand the basic principles, concepts and applications of data warehousing and data mining. • Ability to do Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment. • Study applications and trends in data mining. • Have a good knowledge of the fundamental concepts and the recent trends in this field.
R20CSE1518	Storage Area Networks	I Year- II Semester	<ul style="list-style-type: none"> • Demonstrate In-depth knowledge/ Scholarship of knowledge in the area of storage area networks. • Engage in independent study to prepare an oral presentation to address latest topics on storage networks. • Prepare a technical document for the solutions for the storage area networks related proposed system. • Engage in critical analysis to arrive at a valid conclusion through theoretical approach to provide an alternate solution to an identified problem in the area of storage area networks. • Demonstrate In-depth knowledge/ Scholarship of knowledge in.
R20CSE1519	Android Application Development	I Year- II Semester	<ul style="list-style-type: none"> • Demonstrate the android features and create, develop using android • Demonstrate and Understanding anatomy of an Android application • Apply the android geo location based services • Illustrate the android wifi features and advance android development • Demonstrate the linux security and implement ADL interface
R20CSE1520	Bioinformatics	I Year- II Semester	<ul style="list-style-type: none"> • Explain the basic principles that underpin Bioinformatics analyses, and apply these principles when analyzing biological data; • Survey a selected field within Bioinformatics, synthesize information from primary literature, and coherently report your findings in a written document; • Analyze biological data using a variety of Bioinformatics tools; • Interpret correctly the outputs from tools used to analyses biological data and make meaningful predictions from these outputs
R20CSE1521	Semantic Web and Social Networks	I Year- II Semester	<ul style="list-style-type: none"> • Ability to understand and knowledge representation for the semantic web • Ability to create ontology

			<ul style="list-style-type: none"> • Ability to build a blogs and social networks • Understand the basics of Semantic Web and Social Networks. • Understand Electronic sources for network analysis and different Ontology languages. • Modeling and aggregating social network data. • Develop social-semantic applications. • Evaluate Web- based social network and Ontology.
R20CSE1522	Wireless Networks and Mobile Computing	I Year- II Semester	<ul style="list-style-type: none"> • Understand the principles of wireless communications. • Understand fundamentals of wireless networking • Understand cellular system design concepts. • Analyze various multiple access schemes used in wireless communication. • Understand wireless wide area networks and their performance analysis. • Demonstrate wireless local area networks and their specifications.
R20CSE1523	Distributed Systems and Cloud Computing	I Year- II Semester	<ul style="list-style-type: none"> • Ability to understand the virtualization and cloud computing concepts.
R20CSE1524	Game Theory	I Year- II Semester	<ul style="list-style-type: none"> • Solve strategic games between two and more agents in non-cooperative scenario. • Analyze and solve both simultaneous-moves and sequential-moves games. • Learn different methods to solve games.
R20CSE1603	Web Services Lab	I Year- II Semester	<ul style="list-style-type: none"> • Design and implement web services for single and multiuser applications. • Develop the responsive services using HTTP. • Implement the web based services for customer operations. • Deploy the web services with the database connectivity. • Apply the web based concepts in real time applications.

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M.Tech. – EMBEDDED SYSTEMS
(BR20)

COURSE OUTCOMES (COs)

Course Code	Course Name	Year / Semester	Course Outcomes
R20ES1501	Microcontrollers & Programmable Digital Signal Processors	I Year- I Semester	<ul style="list-style-type: none"> • Compare and select ARM processor core based SoC with several features/peripherals based on requirements of embedded applications. • Identify and characterize architecture of Programmable DSP Processors • Develop small applications by utilizing the ARM processor core and DSP processor based platform.
R20ES1502	System Design with Embedded Linux	I Year- I Semester	<ul style="list-style-type: none"> • Familiarity of the embedded Linux development model. • Write, debug, and profile applications and drivers in embedded Linux. • Understand and create Linux BSP for a hardware platform
R20ES1503	Programming Languages for Embedded Software	I Year- I Semester	<ul style="list-style-type: none"> • Write an embedded C application of moderate complexity. • Develop and analyze algorithms in C++. • Differentiate interpreted languages from compiled languages.
R20ES1504	AI & Machine Learning	I Year- I Semester	
R20ES1505	Computer Vision	I Year- I Semester	<ul style="list-style-type: none"> • Study the image formation models and feature extraction for computer vision • Identify the segmentation and motion detection and estimation techniques • Develop small applications and detect the objects in various applications
R20ES1506	Communications Buses & Interfaces	I Year- I Semester	<ul style="list-style-type: none"> • Select a particular serial bus suitable for a particular application. • Develop APIs for configuration, reading and writing data onto serial bus. • Design and develop peripherals that can be interfaced to desired serial bus.
R20ES1507	Parallel Processing	I Year- I Semester	<ul style="list-style-type: none"> • Identify limitations of different architectures of computer • Analysis quantitatively the performance parameters for different architectures • Investigate issues related to compilers and instruction set based on type of architectures. •
R20ES1508	Advanced Computer architecture	I Year- I Semester	<ul style="list-style-type: none"> •

R20ES1601	Microcontroller & Programmable Digital Signal Processors Lab	I Year- I Semester	<ul style="list-style-type: none"> • Install, configure and utilize tool sets for developing applications based on ARM processor core SoC and DSP processor. • Develop prototype codes using commonly available on and off chip peripherals on the Cortex M3 and DSP development boards.
R20ES1602	System Design with Embedded Linux Lab	I Year- I Semester	<ul style="list-style-type: none"> •
R20ES1509	Research Methodology & IPR	I Year- I Semester	<ul style="list-style-type: none"> • Understand research problem formulation. • Analyze research related information • Follow research ethics • Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity. • Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular. • Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits. •
Audit Course - I			
R20ES1701	English for Research Paper Writing	I Year- I Semester	
R20ES1702	Disaster Management	I Year- I Semester	
R20ES1703	Value Education	I Year- I Semester	<ul style="list-style-type: none"> • Knowledge of self-development • Learn the importance of Human values • Developing the overall personality
R20ES1510	RTL Simulation and Synthesis with PLDs	I Year- II Semester	<ul style="list-style-type: none"> • Familiarity of Finite State Machines, RTL design using reconfigurable logic. • Design and develop IP cores and Prototypes with performance guarantees • Use EDA tools like Cadence, Mentor Graphics and Xilinx
R20ES1511	Advanced Digital Signal Processing	I Year- II Semester	<ul style="list-style-type: none"> • TTo understand theory of different filters and algorithms • TTo understand theory of multirate DSP, solve numerical problems and write algorithms • TTo understand theory of prediction and

			<p>solution of normal equations</p> <ul style="list-style-type: none"> • To know applications of DSP at block level.
R20ES1512	IOT and its Applications	I Year- II Semester	<ul style="list-style-type: none"> • Understand the concept of IOT and M2M • Study IOT architecture and applications in various fields • Study the security and privacy issues in IOT.
R20ES1513	VLSI Signal Processing	I Year- II Semester	<ul style="list-style-type: none"> • Ability to modify the existing or new DSP architectures suitable for VLSI. • Understand the concepts of folding and unfolding algorithms and applications. • Ability to implement fast convolution algorithms. • Low power design aspects of processors for signal processing and wireless applications.
R20ES1514	SOC Architecture	I Year- II Semester	
R20ES1515	Hardware and Software Co-Design	I Year- II Semester	<ul style="list-style-type: none"> • To acquire the knowledge on various models of Co-design. • To explore the interrelationship between Hardware and software in a embedded system • To acquire the knowledge of firmware development process and tools during Co-design. • Understand validation methods and adaptability.
R20ES1516	Network Security and Cryptography	I Year- II Semester	<ul style="list-style-type: none"> • Identify and utilize different forms of cryptography techniques. • Incorporate authentication and security in the network applications. • Distinguish among different types of threats to the system and handle the same.
R20ES1517	Physical Design Automation	I Year- II Semester	<ul style="list-style-type: none"> • Study automation process for VLSI System design. • Understanding of fundamentals for various physical design CAD tools. • Develop and enhance the existing algorithms and computational techniques for physical design process of VLSI systems.
R20ES1603	RTL Simulation and Synthesis with PLDs Lab	I Year- II Semester	<ul style="list-style-type: none"> • Identify, formulate, solve and implement problems in signal processing, communication systems etc using RTL design tools. • Use EDA tools like Cadence, Mentor Graphics and Xilinx or equivalent tools
R20ES1604	Advanced Digital Signal Processing Lab	I Year- II Semester	<ul style="list-style-type: none"> •
R20ES1605	Mini project	I Year- II	<ul style="list-style-type: none"> •

	with Seminar	Semester	
Audit Course - II			
R20ES1704	Constitution of India	I Year- II Semester	<ul style="list-style-type: none"> • Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics. • Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India. • 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. • Discuss the passage of the Hindu Code Bill of 1956.
R20ES1705	Pedagogy Studies	I Year- II Semester	<ul style="list-style-type: none"> • What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries? • What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners? • How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
R20ES1706	Stress Management by yoga	I Year- II Semester	<ul style="list-style-type: none"> • Develop healthy mind in a healthy body thus improving social health also • Improve efficiency
R20ES1518	Scripting Languages	II Year- I Semester	
R20ES1519	Memory Technologies	II Year- I Semester	<ul style="list-style-type: none"> • Select architecture and design semiconductor memory circuits and subsystems. • Identify various fault models, modes and mechanisms in semiconductor memories and their testing procedures. • Know, how of the state-of-the-art memory chip design
R20ES1520	Wireless Sensor Networks	II Year- I Semester	<ul style="list-style-type: none"> • Analyze and compare various architectures of Wireless Sensor Networks • Understand Design issues and challenges in wireless sensor networks • Analyze and compare various data gathering and data dissemination methods. • Design, Simulate and Compare the

			performance of various routing and MAC protocol
OPEN ELECTIVE			
R20ES1521	Business Analytics	II Year- I Semester	
R20ES1522	Industrial Safety	II Year- I Semester	
R20ES1523	Operations Research	II Year- I Semester	<ul style="list-style-type: none"> • Students should able to apply the dynamic programming to solve problems of discreet and continuous variables. • Students should able to apply the concept of non-linear programming • Students should able to carry out sensitivity analysis • Student should able to model the real world problem and simulate it.
R20ES1524	Energy from Waste	II Year- I Semester	

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**MASTER OF BUSINESS
ADMINISTRATION**

(BR20)

COURSE OUTCOMES (COs)

Course Code	Course Name	Year / Semester	Course Outcomes
R20MBA01	Management and Organisational Behaviour	I Year - I Semester	<ul style="list-style-type: none"> • Evolution of Management and contribution of Management thinkers • The relevance of environmental scanning, planning and to take decisions • Organizing and controlling • Individual and group Behavior • Leadership and Motivation.
R20MBA02	Business Economics	I Year - I Semester	<ul style="list-style-type: none"> • Economic Principles in Business • Forecast Demand and Supply • Production and Cost Estimates • Market Structure and Pricing Practices • Economic Policies.
R20MBA03	Financial Accounting & Analysis	I Year - I Semester	<ul style="list-style-type: none"> • Principles of Accounting, Accounting Process • Inventory Valuation • Preparation, Analysis and Interpretation of Financial Statements.
R20MBA04	Business Statistics	I Year - I Semester	<ul style="list-style-type: none"> • Conceptual overview of Statistics • To apply, analyze various simple & advanced statistical tools • To interpret data through statistical tools.
R20MBA05	Business Law and Ethics	I Year - I Semester	<ul style="list-style-type: none"> • Business Laws related to incorporating a company • Importance of Ethics in Business • Cyber Crime and Legal Aspects.
OPEN ELECTIVE-I			
R20MBA06	6A Business Research Methodology	I Year - I Semester	<ul style="list-style-type: none"> • Basics of Research Methodology and Research Design • Data Collection methods and the tools for analysis and interpretation • Importance of presentation of data

			analysis and report writing including referencing style.
	6B Project Management	I Year - I Semester	<ul style="list-style-type: none"> • Importance of Project Management • Project Planning, Execution and implementation • Significance of teams in projects • Project evaluation techniques.
	6C Technology	I Year - I Semester	<ul style="list-style-type: none"> • Importance of Technological Innovation • Importance of Research and development in technology management • Forecasting of Technology
	Management 6D Rural Marketing	I Year - I Semester	<ul style="list-style-type: none"> • Rural Marketing opportunities • Rural Economy and Environment • Social and cultural aspects in rural India • Innovations in rural marketing.
R20MBA07	Business Communication - Lab	I Year - I Semester	<ul style="list-style-type: none"> • The importance of Communication in Business • To develop writing skills and presentation • Writing business proposals and letters • Application of business communication in the self development process.
R20MBA08	Human Resource Management	I Year - II Semester	<ul style="list-style-type: none"> • Basic HR concepts • Process of recruitment and selection, • Learning and development • Performance Management and Compensation • Employee retention strategies • Importance of employee welfare and grievances.
R20MBA09	Marketing Management	I Year - II Semester	<ul style="list-style-type: none"> • Concepts of marketing management • To analyze markets and design customer driven strategies • To communicate the decisions towards business development with superior customer value.

R20MBA10	Financial Management	I Year - II Semester	<ul style="list-style-type: none"> • Goals of financial function • Investment criteria and decision process • Capital structure and Dividend Decisions • Asset Liability management
R20MBA11	Quantitative Analysis for Business Decisions	I Year - II Semester	<ul style="list-style-type: none"> • The course covers origin and application of OR, • Linear Programming Method, • Decision Theory and queuing theory. These concepts help the student in taking decisions for business.
R20MBA12	Entrepreneurship	I Year - II Semester	<ul style="list-style-type: none"> • Mindset of the entrepreneurs, • Identify ventures for launching, • Develop an idea on the legal framework and • Strategic perspectives in entrepreneurship.

OPEN ELECTIVE-II

R20MBA13	13A Total Quality Management	I Year - II Semester	<ul style="list-style-type: none"> • Importance of Quality • Principles and Practices of TQM • Tools and techniques in Quality management.
	13B Corporate Governance	I Year - II Semester	<ul style="list-style-type: none"> • Need for Corporate Governance in India • Codes and Committees in Corporate Governance • Role of Board in Corporate Governance • Stakeholder perspective of Corporate Governance.
	13C International Business	I Year - II Semester	<ul style="list-style-type: none"> • Importance of International Business • International Trade theories • International Economic environment • Strategic and operational issues of IB.
	13D Supply Chain Management	I Year - II Semester	<ul style="list-style-type: none"> • Growing importance of Supply Chain Management • SCM Costs and Performance • Benchmarking in SCM

			<ul style="list-style-type: none"> • Sourcing and transportation • Global aspects in SCM
R20MBA15	Production & Operations Management	II YEAR - I Semester	<ul style="list-style-type: none"> • Concepts of Operations management, • Product & process design, analysis, • Plant location and layout, • Scheduling and Material Management.
R20MBA16	Management Information Systems	II YEAR - I Semester	<ul style="list-style-type: none"> • Concepts & applications of Management Information Systems. • Information Systems Planning & Implementations. • Cyber crime and information security.
R20MBA17	Data Analytics	II YEAR - I Semester	<ul style="list-style-type: none"> • Importance of Analytics • Understanding the analytical tools • Application of Analytical tools to solve business problems.
R20MBA18	Strategic Management	II YEAR - I Semester	<ul style="list-style-type: none"> • Strategic management concepts • Tools and Techniques for Strategic analysis • Strategies for competing in globalised markets • Strategy Evaluation and Control.
R20MBA19	Digital Marketing	II YEAR - I Semester	<ul style="list-style-type: none"> • The applications of digital marketing in the globalized market • Channels of Digital Marketing • Digital marketing plan • Search engine marketing • Online Advertising
R20MBA20	Advertising and Sales Management	II YEAR - I Semester	<ul style="list-style-type: none"> • Student will be able to understand the importance of Sales Management, Sales Planning and Budgeting and need for distribution channels and managing them.
R20MBA21	Consumer Behavior	II YEAR - I Semester	<ul style="list-style-type: none"> • Understand consumer behaviour • Environmental influences on consumer behaviour, • Perception and attitude of consumers, • Consumer decision making • Marketing ethics towards consumers.

R20MBA22	Customer Relationship Management	II YEAR - II Semester	<ul style="list-style-type: none"> • Need of CRM • Building customer relations • CRM process • CRM structures • Planning and Implementation of CRM.
R20MBA23	International Marketing	II YEAR - II Semester	<ul style="list-style-type: none"> • The Global Marketing Management, • Environment of global markets, • Assessing Global Market Opportunities, • Developing and Implementing Global Marketing Strategies.
R20MBA24	Marketing of Services	II YEAR - II Semester	<ul style="list-style-type: none"> • Marketing Management of companies offering Services • Characteristics of services, • To understand consumer behaviour in services, • Align service design and standards, • Delivering service, managing services promises.
