HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
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HINDUSTHAN
EDUCATIONAL AND CHARITABLE TRUST
HICET

PROGRAMME OUTCOMES
&
COURSE OUTCOMES MANUAL

R2016 & R2019

Dean Academics

Dean (Academics)
HiCET

Principal

PRINCIPAL
Hindusthan College of Engineering & Technology
COIMBATORE - 641 032

HINDUSTHAN COLLEGE OF ENGINEERING & TECHNOLOGY * CBE-32 *

21-22

HICET

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)
PROGRAMME OUTCOMES (POs)
& COURSE OUTCOMES (COs)

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HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)**

DEPARTMENT NAME	AERONAUTICAL ENGINEERING
PROGRAMME NAME	B.E.-AERONAUTICAL ENGINEERING
REGULATIONS	R-2019

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO1	Graduates shall exhibit their sound theoretical, practical skills and knowledge for successful employments or higher studies or research or entrepreneurial assignments.
PEO2	Graduates shall have lifelong learning skills, professional ethics and good communication capabilities along with entrepreneur skills and leadership, so that they can succeed in their life.
PEO3	Graduates shall become leaders and innovators by devising engineering solutions for social issues and problems

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated

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	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 public health and safety, and 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 modeling 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.
PO 9	**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 the 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 ones 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.

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COURSE OUTCOMES (COs)

PROGRAM NAME – B.E.-AERONAUTICAL ENGINEERING

Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSE CODE : 21HE1101 COURSE NAME : TECHNICAL ENGLISH	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	Acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE : 21MA1102 COURSE NAME : CALCULUS AND LINEAR ALGEBRA	
CO1	Apply the concept of differentiation in any curve.
CO2	Identify the maximum and minimum values of surfaces.
CO3	Apply double integrals to compute area of plane curves.
CO4	Evaluation of triple integrals to compute volume of solids.
CO5	Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies (or Eigen frequencies) of vibration and the shapes of these vibrational modes.

COURSE CODE : 21PH1151 COURSE NAME : APPLIED PHYSICS	
CO1	Illustrate the fundamental properties of matter
CO2	Discuss the Oscillatory motions of particles
CO3	Analyze the wavelength of different colors
CO4	Understand the advanced technology of LASER in the field of Engineering
CO5	Develop the technology of fiber optical communication in engineering field

COURSE CODE : 21CY1151 COURSE NAME : CHEMISTRY FOR ENGINEERS	
CO1	Differentiate hard and soft water and to solve the related problems on water purification and its significance in industries and daily life
CO2	Acquire the basic knowledge of polymers, composites and FRP and their significance.

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CO3	Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences to minimize corrosion to improve industrial design.
CO4	Develop knowledge about the renewable energy resources and batteries along with the need of new materials to improve energy storage capabilities.
CO5	Identify the structure and characteristics of unknown/new compound with the help of spectroscopy.

COURSE CODE : 21CS1151 COURSE NAME : PYTHON PROGRAMMING AND PRACTICES	
CO1	Develop algorithmic solutions to simple computational problems
CO2	Read, write, execute by hand simple Python programs
CO3	Structure simple Python programs for solving problems and Decompose a Python program into functions
CO4	Represent compound data using Python lists, tuples, dictionaries
CO5	Read and write data from/to files in Python Programs.

COURSE CODE : 21ME1152 COURSE NAME : ENGINEERING DRAWING	
CO1	Understand and interpret the engineering drawings in order to visualize the objects and draw the conics and special curves.
CO2	Draw the orthogonal projections of straight lines and planes.
CO3	Interpret the projections of simple solid objects in plan and elevation.
CO4	Draw the projections of section of solids and development of surfaces of solids.
CO5	Draw the isometric projections and the perspective views of different objects.

COURSE CODE : 21HE1071 COURSE NAME : LANGUAGE COMPETENCY ENHANCEMENT	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE : 21HE1072 COURSE NAME : CAREER GUIDANCE – LEVEL I	
CO1	Enable students to approach learning Aptitude with ease, and understand recruiter expectation.

COURSE CODE : 21HE1073 COURSE NAME : ENTREPRENEURSHIP & INNOVATION	
CO1	Understand the nature of business opportunities, resources, and industries in critical and creative aspects.

CO2	Understand the processes by which innovation is fostered, managed, and commercialized.
CO3	Remember effectively and efficiently the potential of new business opportunities.
CO4	Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness..
CO5	Develop a business model for a new venture, including revenue. Margins, operations, working capital, and investment.

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COURSE OUTCOMES (COs)

SEMESTER II

COURSE CODE : 21HE2101 COURSE NAME : BUSINESS ENGLISH FOR ENGINEERS	
CO1	Introduced to different modes and types of business communication.
CO2	Practiced to face and react to various professional situations efficiently.
CO3	Learnt to practice managerial skills.
CO4	Familiarized with proper guidance to business writing.
CO5	Trained to analyze and respond to different types of communication.

COURSE CODE : 21MA2101 COURSE NAME : DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLES	
CO1	Apply few methods to solve different types of first order differential equations.
CO2	Develop sound knowledge of techniques in solving ordinary differential equations.
CO3	Solve the Partial Differential Equations using various methods.
CO4	Infer the knowledge of construction of analytic functions and conformal mapping.
CO5	Evaluate real and complex integrals over suitable closed paths or contours.

COURSE CODE : 21EE2103 COURSE NAME : BASIC OF ELECTRICAL AND ELECTRONICS ENGINEERING	
CO1	Apply the KVL and KCL in Electrical circuits.
CO2	Explain the constructional features of AC and DC machines.
CO3	Identify electronics components and use of them to design circuits.
CO4	Use appropriate logic gates in circuit design.

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CO5	Construct block diagram and explain TV, satellite and optical fibre communication systems.

COURSE CODE : 21ME2101 COURSE NAME : ENGINEERING MECHANICS	
CO1	Define and illustrate the basic concepts of force system.
CO2	Identify the resultant force and couple, support reactions of the beam.
CO3	Calculate the Centre of gravity and moment of inertia of an object.
CO4	Examine the friction force of particles and objects for Impending Motion.
CO5	Determine the Displacement, velocity and acceleration of particles and objects

COURSE CODE : 21PH2151 COURSE NAME : MATERIAL SCIENCE	
CO1	Understand the purpose of acceptor or donor levels and the band gap of a semiconductor
CO2	Interpret the basic idea behind the process of magnetism and its applications in everyday
CO3	Discuss the behavior of super conducting materials
CO4	Illustrate the types and importance of crystal systems
CO5	Evaluate the production of ultrasonics and its applications in NDT

COURSE CODE : 21CY2151 COURSE NAME : ENVIRONMENTAL STUDIES	
CO1	Develop an understanding of different natural resources including renewable resources.
CO2	Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
CO3	Understand the causes of environmental pollution and hazards due to manmade activities.
CO4	Demonstrate an appreciation for need for sustainable development and understand the various Social issues and solutions to solve the issues.
CO5	Gain knowledge about the importance of women and child education and know about the existing technology to protect environment

COURSE CODE : 21HE2071 COURSE NAME : LANGUAGE COMPETENCY ENHANCEMENT COURSE- II	
CO1	Introduced to different modes and types of communication.
CO2	Practiced to face and react to various professional situations efficiently.
CO3	learnt to practice managerial skills.
CO4	Familiarized with proper guidance to writing.
CO5	Trained to analyze and respond to different types of communication

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COURSE CODE : 21ME2001/21EE2001 COURSE NAME : ENGINEERING PRACTICES LABORATORY	
CO1	Fabricate wooden components and pipe connections including plumbing works.
CO2	Fabricate simple weld joints.
CO3	Fabricate different electrical wiring circuits and understand the AC Circuits.

COURSE CODE : 21HE2072 COURSE NAME : CAREER GUIDANCE – LEVEL II	
CO1	Enable students to solve questions on Verbal, Logical and Quantitative Aptitude of placement level

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COURSE OUTCOMES (COs)

SEMESTER III

COURSE CODE : 19MA3101 COURSE NAME : FOURIER SERIES AND STATISTICS	
CO1	Understand the mathematical principles of Fourier series which would provide them the ability to formulate and solve some of the physical problems of engineering.
CO2	Apply the concept of application of Fourier series in solving the heat and wave equations.
CO3	Understand the mix proportioning techniques for field applications.
CO4	Understand the concept of statistical methods for testing the hypothesis.
CO5	Apply design of experiment techniques to solve engineering problem.

COURSE CODE : 19AE3201 COURSE NAME : ELEMENTS OF AERONAUTICS	
CO1	Understand the functions of aircraft components.
CO2	Able to identify the types of flight vehicles and control systems.
CO3	Understand the basic concepts of flight mechanics.
CO4	Understand the working principle of various aircraft propulsion system.
CO5	Acquire the knowledge about various materials used for aircraft construction.

COURSE CODE : 19AE3202 COURSE NAME : ENGINEERING FLUID MECHANICS

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CO1	Apply mathematical knowledge to predict the properties and characteristics of a fluid.
CO2	Capacity in working with the conservative laws and flow through circular conduits
CO3	Proficiency in Dimensional Analysis
CO4	Capability to analyze the performance of pumps
CO5	Ability to evaluate the performance of turbines

COURSE CODE : 19AE3203 COURSE NAME : SOLID MECHANICS	
CO1	Ability to learn the behaviors of materials under axial loading conditions.
CO2	Ability to sketch the Shear Force and bending moment diagram for beams with various loadings.
CO3	Analyze the deflections of the beams under various loading conditions.
CO4	Evaluate the springs and to calculate the stresses in circular shafts.
CO5	Construct Mohr's circle for materials due to axial, bending, torsional and combined loads.

COURSE CODE : 19AE3251 COURSE NAME : AERO ENGINEERING THERMODYNAMICS	
CO1	Apply the thermodynamic principles to various thermal equipment.
CO2	Acquire the knowledge about Carnot theorem and reversibility.
CO3	Ability to interpret the various thermodynamic cycles used for energy production and analyze the performance of thermodynamic cycles.
CO4	Ability to determine the performance of Refrigeration and Air-conditioning systems
CO5	Understand the various aircraft propulsion systems.

COURSE CODE : 19AE3001 COURSE NAME : AIRCRAFT COMPONENT DRAWING LABORATORY	
CO1	Ability to identify the tools used in modelling software.
CO2	Ability to design various aircraft components and control systems.
CO3	Acquire the knowledge on operations using CNC machine.

COURSE CODE : 19AE3002 COURSE NAME : FLUID MECHANICS AND SOLID MECHANICS LABORATORY	
CO1	Ability to use the measurement equipment for flow measurement
CO2	Carryout Performance test on different fluid machinery
CO3	Exposure to the characteristics of Pumps and Turbines
CO4	Understand the structural behavior of various materials.
CO5	Able to experimentally evaluate the structural characteristics of helical spring and beams.

COURSE CODE : 19AC3191

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COURSE NAME : INDIAN CONSTITUTION	
CO1	Understand the functions of the Indian government
CO2	Understand and abide the rules of the Indian constitution.

COURSE CODE : 19HE3072 COURSE NAME : CAREER GUIDANCE – LEVEL III	
CO1	Understand the functions of the Indian government
CO2	Understand and abide the rules of the Indian constitution.

COURSE CODE : 19HE3073 COURSE NAME : LEADERSHIP MANAGEMENT SKILLS	
CO1	To practice essential leadership skills in day to day operations
CO2	To work on leadership skills in the study environment
CO3	To understand and develop the skills consciously.
CO4	To know about the real worth of all the skills for success
CO5	To Analyze the real worth of the person and suggestion for improvement

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COURSE OUTCOMES (COs)

SEMESTER IV

COURSE CODE : 19MA4101 COURSE NAME : NUMERICAL METHODS	
CO1	Solve the system of linear algebraic equations which extends its applications in the field of engineering.
CO2	Apply various methods to find the intermediate values for the given data.
CO3	Identify various methods to perform numerical differentiation and integration.
CO4	Classify and solve ordinary differential equations by using single and multi step methods.
CO5	Illustrate various methods to find the solution of ordinary and partial differential equations.

COURSE CODE : 19AE4201 COURSE NAME : AERODYNAMICS	
CO1	Apply governing equation to various fluid flow models
CO2	Apply the knowledge of basic flows to the various bodies in the atmosphere for the generation of lift.
CO3	Solve the aerodynamic problems associated with the airfoils.
CO4	Simulate wings with help of aerodynamic tools for various ambient conditions
CO5	Acquire knowledge on incompressible flow and viscous flow.

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COURSE CODE : 19AE4202 COURSE NAME : GAS TURBINE PROPULSION	
CO1	Analyze thermodynamics of an aircraft jet engine and calculate the performance measures, such as thrust and specific fuel consumption in terms of design requirement.
CO2	Apply the knowledge to design suitable inlets for aircraft at different conditions
CO3	Ability to choose suitable combustion chamber for various aircraft.
CO4	Ability to determine the performance and design parameters of various compressors
CO5	Evaluate the operating characteristics of turbines in terms of given blade shapes, angles, and direction of rotation.

COURSE CODE : 19AE4203 COURSE NAME : MECHANICS OF MACHINES	
CO1	Ability to design various mechanical components.
CO2	Acquire the knowledge on gears and gear trains.
CO3	Ability to utilize the frictional force into effect.
CO4	Analyze the forces acting on the mechanism.
CO5	Ability to balance the forces and vibration in a machine.

COURSE CODE : 19AE4251 COURSE NAME : AIRCRAFT STRUCTURES - I	
CO1	Analyze the forces on trusses under various types of loading and support conditions.
CO2	Calculate deflection and forces on statically indeterminate aircraft structural components.
CO3	Analyze the beams and trusses using energy method.
CO4	Understand the stability of the column used as aircraft component.
CO5	Design the aircraft structural component using different theories of failure.

COURSE CODE : 19AE4001 COURSE NAME : AERODYNAMICS LABORATORY	
CO1	Exposure to the calibration of Wind Tunnel
CO2	Ability to measure aerodynamic forces around Airfoils
CO3	Ability to measure force for small Aspect ratio models
CO4	Understand the pressure distribution of flow over different profiles
CO5	Ability to visualize flow using Smoke and water channel
COURSE CODE : 19AE4002 COURSE NAME : PROPULSION LABORATORY	
CO1	Identify the components and Understand the working principle of various aircraft engines.
CO2	Ability to evaluate the velocity profile of jets and select the blade profile for compressors and turbines.

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CO3	Ability to determine the properties of fuel and Coefficient of performance of various heat exchangers.
CO4	Understand the inspection and maintenance procedures followed in overhauling of Aircraft engines.
CO5	Ability to find defects in engine components using various non-destructive methods and understand the starting procedures of aircraft engine.

COURSE CODE : 19AC4191 COURSE NAME : ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	
CO1	Ability to understand the structure of Indian system of life.
CO2	Connect up and explain basics of Indian Traditional knowledge in modern scientific perspective.

COURSE CODE : 19HE4072 COURSE NAME : CAREER GUIDANCE – LEVEL IV	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

COURSE CODE : 19HE4073 COURSE NAME : IDEATION SKILLS	
CO1	Develop a strong understanding and importance of ideation
CO2	Learn about the different kinds of tools for Ideation.
CO3	Learn the need and significance of prototyping and its significance.

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COURSE OUTCOMES (COs)

SEMESTER V

COURSE CODE : 19AE5201 COURSE NAME : ADVANCED PROPULSION	
CO1	Know about the various nozzles and its flow characteristics.
CO2	Gain knowledge about the high-speed jet engines.
CO3	Understand the basic concepts in non-air breathing engines and solid rockets.
CO4	Expand their knowledge on liquid propellants used in rockets.
CO5	Familiarize about the advanced propulsion systems used in space missions.

COURSE CODE : 19AE5202 COURSE NAME : AIRCRAFT STRUCTURES - II	
CO1	Determine the Bending stress for wing and fuselage structural component.

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CO2	Analyze the shear flow distribution for open section.
CO3	Analyze the shear flow distribution for closed section subjected to torsion and shear.
CO4	Construct the Aircraft skin with stiffener and their location.
CO5	Identify design features of aircraft wing and fuselage structures, and to calculate load factors and margins of safety for various loading conditions.

COURSE CODE : 19AE5203 COURSE NAME : FLIGHT DYNAMICS	
CO1	Predict the aerodynamic characteristics of the airplane, the engine performance and how flight altitude affects the airplane performance.
CO2	Design aircraft parameters according to the mission requirement.
CO3	Perform preliminary design computations to meet static stability and trim requirements
CO4	Identify the lateral and longitudinal modes and relate the important physical Influences of aircraft properties on these modes.
CO5	Determine the aircraft dynamic stability characteristics.

COURSE CODE : 19AE5204 COURSE NAME : HIGH SPEED AERODYNAMICS	
CO1	Understand characteristics of compressible fluid flows.
CO2	Estimate the properties across normal and oblique shocks.
CO3	Identify the flow patterns across expansion waves.
CO4	Compare the effect of compressible and incompressible flow.
CO5	Handle wind tunnels for evaluating high speed flow behaviors.

COURSE CODE : 19HE5071 COURSE NAME : SOFT SKILLS - I	
CO1	Students will have clarity on their career exploration process and to match their skills and interests with a chosen career path.
CO2	Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others
CO3	Students will understand how teamwork can support leadership skills
CO4	Students will be able to make sense of problems, develop strategies to find solutions, and persevere in solving them.
CO5	Students will demonstrate an enhanced ability to draw logical conclusions and implications to solve logical problems.

COURSE CODE : 19HE5072 COURSE NAME : DESIGN THINKING	
CO1	Develop a strong understanding of the Design Process
CO2	Learn to develop and test innovative ideas through a rapid iteration cycle.
CO3	Develop teamwork and leadership skills

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COURSE CODE : 19AE5251 COURSE NAME : AIRCRAFT SYSTEMS AND GENERAL MAINTENANCE PRACTICES	
CO1	Describe the principle and working of different aircraft systems.
CO2	Analyze the performance of various aircraft engine systems.
CO3	Understand the operating principle behind basic auxiliary systems.
CO4	Carry out ground servicing of critical aircraft systems.
CO5	Understand the FAA airworthiness regulations and the checklist involved in each inspection of aircraft

COURSE CODE : 19AE5001 COURSE NAME : UAV DESIGN AND AEROMODELLING LABORATORY	
CO1	Build a R.C. Aircraft with given Material.
CO2	Carryout Performance test on various aspects.
CO3	Design all the parts in a R.C. Aircraft.

COURSE CODE : 19AE5002 COURSE NAME : AIRCRAFT STRUCTURES LABORATORY -II	
CO1	Perform test on beam with unsymmetrical Bending, torsion and vibration.
CO2	Locate the Shear center for the various cross sections.
CO3	Fabricate composite specimen

PROFESSIONAL ELECTIVE-I

COURSE CODE : 19EI5331 COURSE NAME : CONTROL ENGINEERING	
CO1	Apply the knowledge for modeling of mechanical and electrical control systems.
CO2	Represent the control system components and reduce them.
CO3	Deduct the different order systems with various inputs and their response.
CO4	Investigate the open and closed loop control systems stability and frequency specifications.
CO5	Analyze sampled and discrete control systems for Aircraft control.

COURSE CODE : 19AE5301 COURSE NAME : AIRCRAFT MATERIALS AND PROCESS	
CO1	Gain knowledge in evolution of aerospace materials and its mechanical behavior.
CO2	Understand corrosion of materials and its treatment.
CO3	Acquire knowledge about ceramics and composites in aviation.
CO4	Identify different types of high temperature materials for aerospace application.
CO5	Understand various manufacturing processes of aircraft materials.

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COURSE CODE : 19AE5302 COURSE NAME : WIND TUNNEL TECHNIQUES	
CO1	Understand the principles and operation of low-speed wind tunnels
CO2	Understand the operating principle of high-speed tunnels.
CO3	Explain the procedure involved in operating hypersonic tunnels.
CO4	Understand the working principle of component axis balance and internal balances.
CO5	Visualize the flow over the component by using various techniques.

COURSE CODE : 19AE5303 COURSE NAME : UAV AND MAV DESIGN	
CO1	Understand the advanced concept of UAV and MAV system design to the engineers.
CO2	Acquire the importance of payload integration with UAV airframe.
CO3	Design avionics hardware
CO4	Perform analysis of UAVs and MAVs subsystems for stable fly
CO5	Acquire knowledge of the development of UAV systems

COURSE CODE : 19AE5304 COURSE NAME : NON DESTRUCTIVE EVALUATION	
CO1	Explain the fundamental concepts of NDT
CO2	Discuss the different methods of NDE
CO3	Explain the concept of Thermography and Eddy current testing
CO4	Interpret the concept of Ultrasonic Testing and Acoustic Emission
CO5	Understand the concept of Radiography

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COURSE OUTCOMES (COs)

SEMESTER VI

COURSE CODE : 19AE6181 COURSE NAME : TOTAL QUALITY MANAGEMENT	
CO1	Understand the evolution of management in different eras.
CO2	Apply the leadership skills.
CO3	Implement the basic tools in management.
CO4	Understand the implication of quality in business.
CO5	Implement the concept of documentation.

COURSE CODE : 19AE6201 COURSE NAME : FINITE ELEMENT METHODS IN ENGINEERING	
CO1	Understand different mathematical techniques used in FEM analysis and use them for solving structural and thermal problems.
CO2	Calculate the stresses in one dimensional structures.

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CO3	Calculate the stresses in two dimensional and axi-symmetric structures
CO4	Evaluate the stresses in non-uniform higher order structures.
CO5	Solve fluid flow and field variable problems.

COURSE CODE : 19AE6202 COURSE NAME : COMPOSITE MATERIALS AND STRUCTURES	
CO1	Understand the mechanics of composite materials.
CO2	Identify and analyze the failure modes based on failure theories.
CO3	Calculate the stresses and strains in a laminate.
CO4	Apply knowledge in manufacturing and repair of composites.
CO5	Solve the structural problems of sandwich panels.

COURSE CODE : 19AE6203 COURSE NAME : HEAT TRANSFER	
CO1	Understand different modes of heat transfer and the resistance concept used in heat conduction
CO2	Apply various correlation used in Convective Heat Transfer problems
CO3	Design different types of heat exchangers.
CO4	Understand the concepts of Black Body, Grey Body, View factor, Radiation shielding and solar heat pipe.
CO5	Describe various heat transfer problems in aerospace engineering.

COURSE CODE : 19HE6071 COURSE NAME : SOFT SKILL-II	
CO1	Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict.
CO2	Students will Actively participate meetings, Group Discussions / interviews and prepare & deliver presentations
CO3	Students will define professional behavior and suggest standards for appearance, actions and attitude in a Business environment.
CO4	Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.
CO5	Students will excel in complex reasoning.

COURSE CODE : 19HE6072 COURSE NAME : INTELLECTUAL PROPERTY RIGHTS (IPR)	
CO1	Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.
CO2	Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development
CO3	Identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing.
CO4	Identify different types of trademarks and procedure for registration

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CO5	Recognize the concept of design, geographical indication and procedure for registration

COURSE CODE : 19AE6001 COURSE NAME : STRUCTURAL SIMULATION LABORATORY	
CO1	Execute design and analysis of various components.
CO2	Simulate flow behavior and perform structural analysis.
CO3	Excel in structural and flow analysis so as to meet the industry requirements.

COURSE CODE : 19AE6002 COURSE NAME : AERO ENGINE AND AIRFRAME LABORATORY	
CO1	Perform repair and maintenance procedures of aircraft engine overhaul.
CO2	Execute repair and maintenance of airframe structures.
CO3	Perform welding of aircraft components.

PROFESSIONAL ELECTIVE-II

COURSE CODE : 19AE6301 COURSE NAME : THEORY OF ELASTICITY	
CO1	Use mathematical knowledge to solve problem related to structural elasticity.
CO2	Identify stress-strain relation in 3D, principal stress and principal strain
CO3	Analyze a structure using Elasticity concepts
CO4	Use analytical techniques to predict deformation, internal force and failure of simple solids and structural components.
CO5	Solve aerospace-relevant problems in plane strain and plane stress in Cartesian and polar coordinates

COURSE CODE : 19AE6302 COURSE NAME : INTRODUCTION TO CRYOGENICS	
CO1	Understand the evolution of cryogenic fluids
CO2	Understand the storage problems of cryogenic fluids
CO3	Predict the heat transfer characteristics
CO4	Identify various operating cycles for cryogenics
CO5	Enumerate the application of cryogenics

COURSE CODE : 19AE6303 COURSE NAME : BOUNDARY LAYER THEORY	
CO1	Capable of identifying the flow types.
CO2	Manipulating the growth of boundary layer thickness.
CO3	Capable of evaluating the effect of boundary layer.
CO4	Ability to understand the effect of wake in turbulent flow.
CO5	Acquire knowledge on control of boundary layer growth.

COURSE CODE : 19AE6304 COURSE NAME : AI & IOT FOR AVIATION	
CO1	Understand about the basics of Artificial intelligence.
CO2	Identify image processing operations and robotic operations.
CO3	Understand the fundamental of IoT.
CO4	Familiarize about the IoT devices.
CO5	Apply the AI and IoT knowledge in their domain specification.

COURSE CODE : 19AE6305 COURSE NAME : AIRFRAME MAINTENANCE AND REPAIR	
CO1	Know the working of airframe components.
CO2	Use their knowledge on tools for plastic maintenance practices.
CO3	Position the aircraft while maintenance in hanger.
CO4	Handle the pneumatic and hydraulic systems used in aircraft.
CO5	Perform the safety practices inside the hanger.

OPEN ELECTIVE-I

COURSE CODE : 19AE6401 COURSE NAME : INTRODUCTION TO FLIGHT	
CO1	Learn the history of various flight over the years.
CO2	Understand the functions of various control components.
CO3	Understand about the aerodynamic behavior of an aircraft.
CO4	Understand about the basic science of aircraft engines.
CO5	Implement structural properties of materials.

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	AERONAUTICAL ENGINEERING
PROGRAMME NAME	B.E.-AERONAUTICAL ENGINEERING
REGULATIONS	R-2016

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO1	Graduates shall exhibit their sound theoretical, practical skills and knowledge for successful employments or higher studies or research or entrepreneurial assignments.
PEO2	Graduates shall have lifelong learning skills, professional ethics and good communication capabilities along with entrepreneur skills and leadership, so that they can succeed in their life.
PEO3	Graduates shall become leaders and innovators by devising engineering solutions for social issues and problems, thus caring.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, research literature, and analyse 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 public health and safety, and 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 modeling 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.

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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 the 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 t h e engineering and management principles and apply these to ones 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)

SEMESTER VII

COURSE CODE : 16AE7201 COURSE NAME : AVIONICS	
CO1	Knowledge of avionics sub systems used in civil and military aircrafts.
CO2	Ability to build Digital avionics architecture
CO3	Ability to design flight decks and cockpits
CO4	Ability to design Navigation system
CO5	Ability to design and perform analysis on air system

COURSE CODE : 16AE7202 COURSE NAME : COMPUTATIONAL FLUID DYNAMICS	
CO1	To create numerical modeling and its role in the field of fluid flow and heat transfer
CO2	To learn the various grid generating techniques.
CO3	To use the various discretization methods and boundary layer equations.
CO4	To learn the various solution methods used in finite element techniques.
CO5	To learn the solution procedures and turbulence modeling to solve flow and heat transfer problems

COURSE CODE : 16AE7001 COURSE NAME : AERO ENGINE AND AIRFRAME LABORATORY	
CO1	Ability to maintain the aero engines.
CO2	Ability to repair the aero engines.
CO3	Knowledge in overhaul of aero engines.
CO4	Ability to perform welding of aircraft components.
CO5	Knowledge of the aircraft joints.

COURSE CODE : 16AE7002 COURSE NAME : AVIONICS LABORATORY	
CO1	Ability to write the programme for control surface deflection.
CO2	Ability to use microprocessor in Flight control.
CO3	Ability to understand digital electronics circuits.
CO4	Ability to perform stability analysis
CO5	Knowledge of the design of avionic systems using MATLAB

PROFESSIONAL ELECTIVE-III

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COURSE CODE : 16AE7301 COURSE NAME : VIBRATION AND ELEMENTS OF AERO ELASTICITY	
CO1	Gaining understanding of single
CO2	Ability to solve multi-degree vibrating systems
CO3	Blast to continuous systems
CO4	Ability to use numerical techniques for vibration problems
CO5	Knowledge acquired in aero elasticity and fluttering

COURSE CODE : 16AE7302 COURSE NAME : SATELLITE PROPULSION	
CO1	Understanding evolution of satellite propulsion
CO2	Understanding separation techniques of satellite
CO3	Identify suitable thrusters for satellites
CO4	Knowledge on control of satellites
CO5	Ability to identify suitable materials for satellites

COURSE CODE : 16AE7303 COURSE NAME : ROCKETS AND MISSILES	
CO1	Knowledge to classify rockets and missiles
CO2	Understanding aerodynamics of rocket and missiles
CO3	Abilty to analyse the motion of rockets
CO4	Knowledge on stages and control of rockets & missiles
CO5	Select suitable materials for various systems

COURSE CODE : 16AE7304 COURSE NAME : AIRFRAME MAINTENANCE AND REPAIR	
CO1	Ability to identify the airframe components
CO2	Skill to repair the plastic components in aircraft.
CO3	Capability to do jack, rig the aircraft
CO4	Analyze the system for defect investigation and repair it.
CO5	Ability to perform investigation skill to maintain the airframe with safety

PROFESSIONAL ELECTIVE-IV

COURSE CODE : 16AE7305 COURSE NAME : EXPERIMENTAL STRESS ANALYSIS	
CO1	Measurement of strain in structures using mechanical and other means.
CO2	Measurement of strain in structures using electrical strain gauges.
CO3	Knowledge in testing and evaluation of stress in photo elastic materials.
CO4	Calculation of failure stress in coatings using different failure theories.
CO5	Extensive knowledge in using non-destructive testing for testing purpose.

COURSE CODE : 16AE7306 COURSE NAME : HELICOPTER THEORY	
CO1	Perform the Aerodynamics calculation of Rotor blade
CO2	Calculate the power components of helicopter blade
CO3	Compare the performance of power plants
CO4	Perform stability and control characteristics of Helicopter
CO5	Control the vibration on helicopter.

COURSE CODE : 16AE7307 COURSE NAME : AIRCRAFT DESIGN	
CO1	Conduct trade-off between the conflicting demands of different disciplines by performing a detailed preliminary design of a complete aircraft.
CO2	Select the appropriate power plant for the aircraft
CO3	Design the control surfaces based on the stability requirements and to select the wing planform based on the mission requirements.
CO4	Estimate weight, wing loading and other performance parameters related to conceptual design of a complete aircraft.
CO5	Identify design features of aerospace structures, and calculate load factors.

COURSE CODE : 16AE7308 COURSE NAME : ENGINE SYSTEM AND CONTROL	
CO1	Understand the basic components of aircraft engine.
CO2	Know the operation of different systems in Aircraft Engines.
CO3	Ability to identify the engine instruments and maintenance of engine.
CO4	Knowledge to develop the various instruments used for engine controls & indication.
CO5	Identify the problem occurs in engine instruments and control the engine instruments.

OPEN ELECTIVE-II

COURSE CODE : 16AE7402 COURSE NAME : AERODYNAMICS FOR INDUSTRIAL APPLICATIONS	
CO1	Identify the Atmospheric wind properties with various terrain fields.
CO2	Analyze the design concept of wind turbines & power efficiency.
CO3	Ability to understand the road vehicles aerodynamics in terms of drag reduction.
CO4	Understand the wind forces on buildings and architectural design parameters
CO5	Apply the knowledge to bluff body aerodynamics and flow induced vibrations.
COURSE CODE : 16AE7403 COURSE NAME : INTRODUCTION TO DRONES	
CO1	Understand the fundamentals of UAVs and UAS.
CO2	Understand various components of Unmanned aerial systems.

CO3	Understand Drone anatomy and get an insight on Drone assembly.
CO4	Understand about areas of Drone applications and Innovations.
CO5	Understand the operational considerations of Drones in airspace.

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COURSE OUTCOMES (COs)

SEMESTER VIII

PROFESSIONAL ELECTIVE-V

COURSE CODE : 16AE8301 COURSE NAME : FATIGUE AND FRACTURE	
CO1	Understands how fatigue occurs in structures.
CO2	Analyze the type of various aspects of fatigue behavior.
CO3	Access the different types of cracks on components.
CO4	Skill to perform on fatigue design.
CO5	Ability to analyze the fracture due to fatigue.

COURSE CODE : 16AE8302 COURSE NAME : PROFESSIONAL ETHICS	
CO1	Knowledge of professional ethics.
CO2	Ability to apply ethics in society.
CO3	Ability to discuss the ethical issues related to engineering.
CO4	Ability to realize the responsibilities.
CO5	Have knowledge on rights in the society

COURSE CODE : 16AE8303 COURSE NAME : SPACE MECHANICS	
CO1	Understands the basic concepts of space.
CO2	Skill to locate the bodies' position in space with respect to time.
CO3	Ability to perform satellite injection, satellite perturbations.
CO4	Capability to find the interplanetary trajectories
CO5	Apply the orbital mechanics to control the missiles.

COURSE CODE : 16AE8304 COURSE NAME : AVIATION MANAGEMENT AND AIR SAFETY	
CO1	Ability to understand the role of IATA and ICAO in Air transportation
CO2	Proficiency in Airline management and Airport operations
CO3	Understand the concept of Aviation safety and security
CO4	Understand the various aviation standards in quality assurance, safety rules and regulations.
CO5	Understand Aviation laws and regulations related to each type of organization.

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PROFESSIONAL ELECTIVE-VI

COURSE CODE : 16AE8305 COURSE NAME : STRUCTURAL DYNAMICS	
CO1	To understand single and multi-degree vibrating systems
CO2	To identify, formulate and solve engineering problems.
CO3	Ability to develop the equations of motion for vibratory systems and solving for the free and forced response.
CO4	Capability to use numerical techniques for vibration problems
CO5	To analyze and modify a vibratory structure in order to achieve specified requirements.

COURSE CODE : 16AE8306 COURSE NAME : UAV SYSTEMS	
CO1	Knowledge of classification, models, prototypes and applications of UAV
CO2	Ability to design UAV systems
CO3	Ability to design avionics hardwares
CO4	Ability to use different communication payloads and controls
CO5	Knowledge of the development of UAV systems

COURSE CODE : 16AE8307 COURSE NAME : EXPERIMENTAL AERODYNAMICS	
CO1	Acquiring basics knowledge on aerodynamic flow and wind tunnel measurement systems
CO2	Apply knowledge in wind tunnel measurements
CO3	Learn various flow visualization techniques.
CO4	Execute specific instruments for flow parameter measurement like pressure, velocity, temperature etc.
CO5	Analyze the special flows and uncertainty problems.

COURSE CODE : 16AE8308 COURSE NAME : AIR TRANSPORTATION CONTROL AND PLANNING	
CO1	Acquire the concept of air traffic rules and clearance procedures for airline operation.
CO2	Analyze the various air traffic data for air traffic services.
CO3	Explore the emergency procedure and air rules followed by air traffic control systems.
CO4	Understand the influence of aerodrome design factors for service establishments.
CO5	Gain the information of navigation and emergency procedures in the air traffic control systems.



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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	AUTOMOBILE ENGINEERING
PROGRAMME NAME	B.E AUTOMOBILE ENGINEERING
REGULATIONS	R2019

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO1	Apply analytical and computational techniques to address the challenges in automotive industry.
PEO2	Utilize their leadership skills and entrepreneurial skills to excel in their profession.
PEO3	Exhibit professionalism, team spirit and pursue lifelong learning to achieve career and organizational goals.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

PO1	An ability to apply knowledge of mathematics, basic science and engineering to analyze, design and evaluate automotive components and systems
PO2	An ability to identify, formulate and analyze the problems related to vehicle design, manufacturing, engine performance, flow resistance and maintenance engineering
PO3	An ability to design an automobile system and process to meet standard specifications with due consideration for safety and environment
PO4	An ability to design and conduct of experiments and apply knowledge to analyze and interpret the data for inferring valid conclusions.
PO5	An ability to implement the techniques, programming skills and latest computer aided engineering tools for modeling, simulation and analysis of complex automobile engineering problems.
PO6	An ability to analyze the local and global impact of modern technologies on individual organizations, society and culture
PO7	Apply knowledge of contemporary issues to investigate and solve problems with a concern for sustainability and eco-friendly environment.
PO8	Exhibit responsibility in professional, ethical, legal, security and social issues.
PO9	An ability to comprehend and write effective reports, design documentation, develop effective presentations and give as well as receive clear instructions.

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PO10	An ability to involve multidisciplinary activities effectively as an individual and as a member or a leader in diverse teams.
PO11	An ability to engage in independent and life-long learning for personal and societal development.
PO12	An ability to apply management principles and techniques individually /collaboratively in project planning, implementation and control.



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COURSE OUTCOMES (COs)

PROGRAM NAME – AUTOMOBILE ENGINEERING

Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSE CODE : 21HE1101 COURSE NAME: TECHNICAL ENGLISH	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	Acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE : 21MA1102 COURSE NAME: CALCULUS AND LINEAR ALGEBRA	
CO1	Apply the concept of differentiation in any curve.
CO2	Identify the maximum and minimum values of surfaces.
CO3	Apply double integrals to compute area of plane curves.
CO4	Evaluation of triple integrals to compute volume of solids
CO5	Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies (or Eigen frequencies) of vibration and the shapes of these vibration modes.

COURSE CODE : 21PH1151 COURSE NAME: APPLIED PHYSICS	
CO1	Illustrate the fundamental properties of matter.
CO2	Discuss the Oscillatory motions of particles.
CO3	Analyze the wavelength of different colors.
CO4	Understand the advanced technology of LASER in the field of Engineering.
CO5	Develop the technology of fiber optical communication in engineering field

COURSE CODE : 21CY1151 COURSE NAME: CHEMISTRY FOR ENGINEERS	
CO1	Differentiate hard and soft water and to solve the related problems on water purification and its significance in industries and daily life.
CO2	Acquire the basic knowledge of polymers, composites and FRP and their significance.

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CO3	Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences to minimize corrosion to improve industrial design.
CO4	Develop knowledge about the renewable energy resources and batteries along with the need of new materials to improve energy storage capabilities.
CO5	Identify the structure and characteristics of unknown/new compound with the help of spectroscopy

COURSE CODE : 21CS1151 COURSE NAME: PYTHON PROGRAMMING AND PRACTICES	
CO1	Develop algorithmic solutions to simple computational problems.
CO2	Read, write, execute by hand simple Python programs.
CO3	Structure simple Python programs for solving problems and Decompose a Python program into functions.
CO4	Represent compound data using Python lists, tuples, dictionaries.
CO5	Read and write data from/to files in Python Programs

COURSE CODE : 19ME1152 COURSE NAME : ENGINEERING DRAWING	
CO1	Understand and interpret the engineering drawings in order to visualize the objects and draw the conics and special curves.
CO2	Draw the orthogonal projections of straight lines and planes.
CO3	Interpret the projections of simple solid objects in plan and elevation.
CO4	Draw the projections of section of solids and development of surfaces of solids.
CO5	Draw the isometric projections and the perspective views of different objects.

COURSE CODE : 21HE1071 COURSE NAME : LANGUAGE COMPETENCY ENHANCEMENT COURSE- I	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	Acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE : 21HE1072 COURSE NAME : CAREER GUIDANCE – LEVEL I	
CO1	Enable students to approach learning Aptitude with ease, and understand recruiter expectation.

COURSE CODE : 21HE1073 COURSE NAME : ENTREPRENEURSHIP & INNOVATION	
CO1	Understand the nature of business opportunities, resources, and industries in critical and creative aspects.

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CO2	Understand the processes by which innovation is fostered, managed, and commercialized.
CO3	Remember effectively and efficiently the potential of new business opportunities.
CO4	Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness.
CO5	Develop a business model for a new venture, including revenue. Margins, operations, working capital, and investment.

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COURSE OUTCOMES (COs)

SEMESTER II

COURSE CODE : 19HE2101 COURSE NAME: BUSINESS ENGLISH FOR ENGINEERS	
CO1	Introduced to different modes and types of business communication.
CO2	Practiced to face and react to various professional situations Efficiently.
CO3	Learnt to practice managerial skills.
CO4	Familiarized with proper guidance to business writing.
CO5	Trained to analyze and respond to different types of communication

COURSE CODE : 19MA2101 COURSE NAME : DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLES	
CO1	Apply few methods to solve different types of first order differential equations.
CO2	Develop sound knowledge of techniques in solving ordinary differential equations.
CO3	Solve Partial Differential Equations using various methods.
CO4	Infer the knowledge of construction of analytic functions and conformal mapping.
CO5	Evaluate real and complex integrals over suitable closed paths or contours.

COURSE CODE : 19ME2101 COURSE NAME : ENGINEERING MECHANICS	
CO1	Define and illustrate the basic concepts of force system.
CO2	Identify the resultant force and couple, support reactions of the beam.
CO3	Calculate the Centre of gravity and moment of inertia of an object.

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CO4	Examine the friction force of particles and objects for Impending Motion.
CO5	Determine the Displacement, velocity and acceleration of particles and objects

COURSE CODE : 19PH2151 COURSE NAME : MATERIALS SCIENCE	
CO1	Understand the purpose of acceptor or donor levels and the band gap of a semiconductor.
CO2	Interpret the basic idea behind the process of magnetism and its applications in every day.
CO3	Discuss the behavior of super conducting materials.
CO4	Illustrate the types and importance of crystal systems.
CO5	Evaluate the production of ultrasonic and its applications in NDT

COURSE CODE : 19CY2151 COURSE NAME : ENVIRONMENTAL SCIENCE	
CO1	Develop an understanding of different natural resources including renewable resources.
CO2	Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
CO3	Understand the causes of environmental pollution and hazards due to manmade activities.
CO4	Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues.
CO5	Gain knowledge about the importance of women and child education and know about the existing Technology to protect environment

COURSE CODE : 19IT2151 COURSE NAME : PROGRAMMING IN C	
CO1	Select appropriate data types and control structures for solving a given problem.
CO2	Develop applications using arrays and strings
CO3	Understand the importance of functions, pointers and dynamic memory allocation.
CO4	Understand the Concepts of structures to develop applications in C
CO5	Understand the sequential and random access file processing and develop applications in C

COURSE CODE : 19ME2001 COURSE NAME: ENGINEERING PRACTICES	
CO1	Fabricate wooden components and pipe connections including plumbing works.
CO2	Fabricate simple weld joints.

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CO3	Fabricate different electrical wiring circuits and understand the AC Circuits.

COURSE CODE : 21HE2071 COURSE NAME: LANGUAGE COMPETENCY ENHANCEMENT COURSE- II	
CO1	Introduced to different modes and types of business communication.
CO2	Practiced to face and react to various professional situations efficiently.
CO3	learnt to practice managerial skills.
CO4	Familiarized with proper guidance to business writing.
CO5	Trained to analyze and respond to different types of communication

COURSE CODE : 21HE2072 COURSE NAME: CAREER GUIDANCE – LEVEL II	
CO1	Enable students to approach learning Aptitude with ease, and understand recruiter expectation.

SEMESTER III

COURSE CODE : 19MA3101 COURSE NAME: FOURIER SERIES AND STATISTICS	
CO1	Understand the mathematical principles of Fourier series which would provide them the ability to formulate and solve some of the physical problems of engineering
CO2	Apply the concept of application of Fourier series in solving the heat and wave equations.
CO3	Understand the mix proportioning techniques for field applications.
CO4	Understand the concepts of statistical methods for testing the hypothesis.
CO5	Apply design of experiment techniques to solve various engineering problem.

COURSE CODE : 19AU3201 COURSE NAME: FLUID AND PNEUMATIC SYSTEMS	
CO1	Analyze the application of mass, momentum and energy equation in fluid flow.
CO2	Compare flow rates, pressure changes, minor and major head losses for viscous flows through pipes.

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CO3	Evaluate the performance and operation of hydraulic turbines and pumps
CO4	Apply knowledge and select, operate and maintain various hydraulic systems
CO5	Understand various pneumatic systems for automation applications in suitable manufacturing system

COURSE CODE : 19AU3202 COURSE NAME: ENGINEERING THERMODYNAMICS	
CO1	Understand the thermodynamic principles and its applications.
CO2	Quantify the energy conversion in various thermal systems.
CO3	Identify the losses and inefficient components in the thermodynamic system.
CO4	Apply the thermodynamic principles for predicting the properties of steam, gas and gas mixtures.
CO5	Apply the psychrometric principles for design of air conditioning systems.

COURSE CODE : 19AU3203 COURSE NAME: THEORY OF AUTOMOTIVE ENGINES	
CO1	Illustrate the fundamental concepts and functions of an automotive engine and working cycles.
CO2	Identify the type of injection and ignition systems
CO3	Gain in depth knowledge in combustion phenomena in SI engines
CO4	CI engines combustions were studied for getting wide knowledge in combustion.
CO5	Apply the knowledge to measure the pollution and control

COURSE CODE : 19MC3191 COURSE NAME: INDIAN CONSTITUTION	
CO1	Illustrate the functions of the Indian government
CO2	Illustrate the the rules of the Indian constitution.

COURSE CODE : 19AU3251 COURSE NAME: AUTOMOTIVE STRUCTURES AND DESIGN	
CO1	Illustrate the behavior of materials for different loading conditions.
CO2	Classify the types of beams and various loads acting on it.
CO3	Summarize the concept of torsion loads acting on shafts.
CO4	Illustrate the concept of deflection and its significance
CO5	Calculate the stresses in thin cylinders and impact loading on machine components.

COURSE CODE : 19AU3001 COURSE NAME: AUTOMOTIVE COMPONENTS LABORATORY	
CO1	Differentiate the function of petrol and diesel engines
CO2	Understand the petrol and diesel fuel supply system functions

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CO3	Determine the length, width and other functional parts location on both heavy and light duty vehicle frame
CO4	Acquire knowledge the various parts function in axles and differentials
CO5	Gain knowledge on clutch and gear box arrangements and functions

COURSE CODE : 19AU3002 COURSE NAME : COMPUTER AIDED DRAWING LAB	
CO1	Ability to use the drafting software for machine elements drawing.
CO2	Illustrate the correlated the various view.
CO3	Students can have capable of mark the notation on various parts with uniform styling
CO4	Students able to develop the view from isometric modeling.
CO5	Enrich the knowledge on 3D printing applications

COURSE CODE : 19HE3072 COURSE NAME : CAREER GUIDANCE – LEVEL III	
CO1	Enable students to approach learning Aptitude with ease, and understand recruiter expectation

COURSE CODE : 19HE3073 COURSE NAME : LEADERSHIP MANAGEMENT SKILLS	
CO1	Practice essential leadership skills in day-to-day operations
CO2	Work on leadership skills in the study environment
CO3	Understand and develop the skills consciously.
CO4	Know about the real worth of all the skills for success
CO5	Analyze the real worth of the person and suggestion for improvement

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COURSE OUTCOMES (COs)

SEMESTER IV

COURSE CODE : 19MA4101 COURSE NAME : NUMERICAL METHODS	
CO1	Solve the system of linear algebraic equations which extends its applications in the field of engineering.
CO2	Apply various methods to find the intermediate values for the given data.
CO3	Identify various methods to perform numerical differentiation and integration.
CO4	Classify and solve ordinary differential equations by using single and multi-step methods.

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CO5	Illustrate various methods to find the solution of ordinary and partial differential equations

COURSE CODE : 19AU4201 COURSE NAME: MECHANISM AND MACHINE THEORY	
CO1	Understand the velocity and acceleration of various links of simple mechanisms.
CO2	Analyze and apply the concepts for designing the gear trains and cam mechanisms for transmission of power and torque.
CO3	Analyze and to solve the friction causing in the machine members
CO4	Apply the knowledge of balancing concepts in designing the rotating and reciprocating machine components.
CO5	Evaluate and analyze the various vibrations a machine member.

COURSE CODE : 19AU4202 COURSE NAME: AUTOMOTIVE ENGINE COMPONENTS DESIGN	
CO1	Impart knowledge in automotive engine component materials and stress strain acting on it.
CO2	Compute the design dimensions of various engine components.
CO3	Identify optimal design solutions and to develop their own ideas in compliance with industry standards.
CO4	Familiarize and to demonstrate the engine balancing of rotating masses.
CO5	Command over the automotive engines design with modern system tools.

COURSE CODE : 19AU4203 COURSE NAME : TWO AND THREE WHEELER TECHNOLOGY	
CO1	Summarize the various subsystem of two and three wheeler
CO2	Illustrate parts with vehicle frame of two wheelers.
CO3	Organize the Transmission and braking System of two wheelers.
CO4	Rephrase the three wheelers systems and functionality.
CO5	Outline the various new advancements in two and three wheelers technology.

COURSE CODE : 19MC4191 COURSE NAME: ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	
CO1	Ability to understand the structure of Indian system of life.
CO2	Connect up and explain basics of Indian Traditional knowledge in modern scientific perspective.

COURSE CODE : 19AU4251 COURSE NAME: FUNDAMENTALS OF HEAT TRANSFER	
CO1	Apply heat conduction equations to different surface configurations under steady state and transient conditions and solve problems.
CO2	Apply free and forced convective heat transfer correlations to internal and external flows through various surface configurations and solve problems

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CO3	Apply LMTD and NTU methods of thermal analysis to different types of heat exchanger configurations and solve problems
CO4	Explain basic laws for Radiation and apply these principles to radiative heat transfer between different types of surfaces to solve problems
CO5	Solve problems using refrigerant table / charts and psychrometric charts.

COURSE CODE : 19AU4001 COURSE NAME : COMPUTER AIDED ENGINE COMPONENTS DESIGN LABORATORY	
CO1	Use the drafting and modeling software for automobile components design
CO2	Solve the engine components design calculation
CO3	Validate the selection of material and standard of the components according to the design aspects
CO4	Synthesize, analyse and document the design of various components
CO5	Forecast the faults by means of simulation of assembly

COURSE CODE : 19AU4002 COURSE NAME : TWO AND THREE WHEELERS LABORATORY	
CO1	Simplify the engine components and conduct performance test on two and three wheelers.
CO2	Analyze the various testing procedure of two wheelers using chassis dynamometer
CO3	Identify the performance of Shock Absorber by using shock absorber test rig
CO4	Make use of suitable tools to dismantle & assemble of gearbox of two and three wheelers and drawing of power flow diagram from Input shaft to output shaft
CO5	Make use suitable tools to dismantle & assemble three wheeler steering system and rectifying it.

COURSE CODE : 19HE4072 COURSE NAME : CAREER GUIDANCE – LEVEL IV	
CO1	Enable students to approach learning Aptitude with ease, and understand recruiter expectation

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COURSE CODE : 19AU5201 COURSE NAME : AUTOMOTIVE EMISSION AND POLLUTION CONTROL	
CO1	Demonstrate the fundamentals of formation of automobile pollutions in IC Engines.
CO2	Design the control techniques for minimizing emissions in SI Engine.
CO3	Demonstrate the fundamentals of formation of emission and control in CI Engines.
CO4	Identify the various methods to reduce the noise emissions.
CO5	Experiment with the various methods of test procedures and measurement in automotive engines.

COURSE CODE : 19AU5202 COURSE NAME : VEHICLE DESIGN AND DATA CHARACTERISTICS	
CO1	Demonstrate the design requirements of a vehicle design and procedure.
CO2	Apply the resistance offered to the vehicle and its ability to propel.
CO3	Acquired the performance of the engine and its capacity.
CO4	Approach design concepts of an engine and understand the forces acting within the engine.
CO5	Interpret the working and effectiveness of the fuel systems of a vehicle

COURSE CODE : 19AU5203 COURSE NAME : AUTOMOTIVE FUELS AND LUBRICANTS	
CO1	Gain knowledge on the importance and manufacturing methods in fuels and lubricants.
CO2	Utilize the importance of theory of lubrication.
CO3	Summarize the properties, additives and mechanism of lubricants.
CO4	Show the combustion characteristics of fuels in IC engine
CO5	Inference the combustion of fuels and fuel rating in IC engines

COURSE CODE : 19AU5251 COURSE NAME : AUTOMOTIVE TRANSMISSION	
CO1	Analyze the clutches, gear ratios, Tractive effort, Engine speed & Power and acceleration.
CO2	Summarize the Fluid coupling and torque converters.
CO3	Acquire the knowledge about torque transfer system.
CO4	Categorize the various types of hydrostatic drives and types of Electric drive.
CO5	Analyze the various application of automatic transmission in automobile industry.

COURSE CODE : 19A5252 COURSE NAME : AUTOMOTIVE CHASSIS COMPONENTS DESIGN	
CO1	Impart the knowledge of vehicle frame and able to design it.
CO2	Acquire the knowledge about steering system, its components, functions and wheel alignment along with balancing.

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CO3	Comprehend about the various driveline systems, wheels and tires with its troubleshooting solutions.
CO4	Identify the suitable braking systems based on load conditions, performance and factors with the skills to dismantle, assemble and test it.
CO5	Interfere the automotive suspension systems with its dynamic capabilities.

COURSE CODE : 19AU5001 COURSE NAME : ENGINE PERFORMANCE AND EMISSION TESTING LABORATORY	
CO1	Perform tests using different dynamometers, valve and port timing diagram.
CO2	Experiment with the Performance and emission Test on the multi cylinder CI and SI engines
CO3	Interpret the retardation test on IC engines
CO4	Perform heat balance and Morse test on multi cylinder petrol and diesel engines
CO5	Plot and summarize the P-θ and P-V Diagrams.

COURSE CODE : 19AU5002 COURSE NAME : AUTOMOTIVE FUELS AND LUBRICANTS LABORATORY	
CO1	Develop to produce high focused independent practical skill on fuels and lubricants.
CO2	Identify how they can be involved in doing experiments
CO3	Construct an in-depth analysis related with any fuel / lubricant.
CO4	Describe how the temperature and friction can influence the properties of fuels and lubricants
CO5	Experiment with the properties of grease.

COURSE CODE : 19HE5071 COURSE NAME : SOFT SKILLS - I	
CO1	Students will have clarity on their career exploration process and to match their skills and interests with a chosen career path.
CO2	Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others
CO3	Students will understand how teamwork can support leadership skills
CO4	Students will be able to make sense of problems, develop strategies to find solutions, and persevere in solving them
CO5	Students will demonstrate an enhanced ability to draw logical conclusions and implications to solve logical problems.

COURSE CODE : 19HE5072 COURSE NAME : DESIGN THINKING	
CO1	Develop a strong understanding of the Design Process

CO2	Learn to develop and test innovative ideas through a rapid iteration cycle.
CO3	Develop teamwork and leadership skills

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COURSE OUTCOMES (COs)

SEMESTER VI

COURSE CODE : 19AU6201 COURSE NAME : TOTAL QUALITY MANAGEMENT	
CO1	Interpret the TQM framework and Implement Deming, Juran and Crosby Philosophies.
CO2	Illustrate various statistical tools to measure quality and customer satisfaction and implement relationship between employee and the organization
CO3	Implement Benchmarking, FMEA tools for improving quality for design.
CO4	Defend the quality circles and discover the application of QFD and taguchi's quality for engineering.
CO5	Execute the QMS and EMS to improve quality standards in any organization.

COURSE CODE : 19AU6202 COURSE NAME : VEHICLE DYNAMICS AND CONTROL SYSTEMS	
CO1	Develop physical and mathematical models to predict the dynamic response of vehicles.
CO2	Recognize the proper tires for better performance of vehicle on all the road surfaces
CO3	Summarize the dynamic analyses in the design of vehicles.
CO4	Evaluate the longitudinal dynamics and control in an automobile.
CO5	Explain the handling and control of lateral vibrations of the vehicle

COURSE CODE : 19AU6203 COURSE NAME: FINITE ELEMENT ANALYSIS	
CO1	Develop mathematical models for Boundary Value Problems and their numerical solution.
CO2	Evaluate and interpret FEA analysis results for design and evaluation purposes
CO3	Solve Field, thermal, and structural problems by relating scalar variable functions
CO4	Deduce the expression of field variables for two-dimensional plate and shell element problems

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CO5	Determine the need for Isoparametric transformation and the use of numerical integration.

COURSE CODE : 19AU6251 COURSE NAME : AUTOMOTIVE VEHICLE BODY AND AERODYNAMICS	
CO1	Evaluate the tools used in body repairs and command over vehicle body engineering applications
CO2	Compare and familiar with different aspects of car body and its types.
CO3	Demonstrate the vehicle body regulations to build the bus body.
CO4	Discover some new commercial vehicle body and ergonomics designs.
CO5	Associate the role of various aerodynamic forces and moments and its measuring instruments.

COURSE CODE : 19AU6001 COURSE NAME : FINITE ELEMENT ANALYSIS LABORATORY	
CO1	Model and analyze experiments to meet real world system of various automotive components.
CO2	Perform thermal analysis for automotive engines and various parts related to it.
CO3	Carryout modal analysis of suspension system
CO4	Study the behavior of suspension system and its dynamic behavior.
CO5	Simulate the stress and deflection analysis of vehicular components

COURSE CODE : 19AU6701 COURSE NAME : INTERNSHIP TRAINING / INPLANT TRAINING	
CO1	Acquire knowledge on real time industry expectation, operations and working environment.

COURSE CODE : 19HE6071 COURSE NAME : SOFT SKILLS - II	
CO1	Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict.
CO2	Students will Actively participate meetings, Group Discussions / interviews and prepare & deliver presentations
CO3	Students will define professional behavior and suggest standards for appearance, actions and attitude in a Business environment
CO4	Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.
CO5	Students will excel in complex reasoning.

COURSE CODE : 19HE6072 COURSE NAME : INTELLECTUAL PROPERTY RIGHTS (IPR)	
CO1	Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.
CO2	Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.

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CO3	Identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing.
CO4	Identify different types of trademarks and procedure for registration
CO5	Recognize the concept of design, geographical indication and procedure for registration

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	AUTOMOBILE ENGINEERING
PROGRAMME NAME	B.E AUTOMOBILE ENGINEERING
REGULATIONS	R2016

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO1	Apply analytical and computational techniques to address the challenges in automotive industry.
PEO2	Utilize their leadership skills and entrepreneurial skills to excel in their profession.
PEO3	Exhibit professionalism, team spirit and pursue lifelong learning to achieve career and organizational goals.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

PO1	An ability to apply knowledge of mathematics, basic science and engineering to analyze, design and evaluate automotive components and systems
PO2	An ability to identify, formulate and analyze the problems related to vehicle design, manufacturing, engine performance, flow resistance and maintenance engineering
PO3	An ability to design an automobile system and process to meet standard specifications with due consideration for safety and environment
PO4	An ability to design and conduct of experiments and apply knowledge to analyze and interpret the data for inferring valid conclusions.
PO5	An ability to implement the techniques, programming skills and latest computer aided engineering tools for modeling, simulation and analysis of complex automobile engineering problems.
PO6	An ability to analyze the local and global impact of modern technologies on individual organizations, society and culture
PO7	Apply knowledge of contemporary issues to investigate and solve problems with a concern for sustainability and eco-friendly environment.
PO8	Exhibit responsibility in professional, ethical, legal, security and social issues.
PO9	An ability to comprehend and write effective reports, design documentation, develop effective presentations and give as well as receive clear instructions.
PO10	An ability to involve multidisciplinary activities effectively as an individual and as a member or a leader in diverse teams.

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PO11	An ability to engage in independent and life-long learning for personal and societal development.
PO12	An ability to apply management principles and techniques individually /collaboratively in project planning, implementation and control.

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COURSE OUTCOMES (COs)

SEMESTER VII

COURSE CODE : 16AU7201 COURSE NAME: ENGINE AND VEHICLE MANAGEMENT SYSTEM	
CO1	At the end of the course, the student will understand the micro processor controlled application in automobiles.
CO2	To get in depth knowledge in sensor based vehicle and engine management system for controlling pollution, enhancing safety of the vehicle.
CO3	Students can have capable of finding faults in automotive systems
CO4	Learnt about mapping of ECU
CO5	Develop the autotronics knowledge to their projects

COURSE CODE : 16AU7202 COURSE NAME : PROFESSIONAL ETHICS	
CO1	Gain an understanding of the importance of ethics and its importance to the Human Service Profession.
CO2	Demonstrate a beginning knowledge of the Human Service Code of Ethics and the ethical decision making model.
CO3	Behave cautiously in the safety aspect of societal engineering solutions.
CO4	Understand the impact of personal values and ethics on their professional roles and responsibilities.
CO5	Demonstrate a beginning understanding of the relationship between personal values and professional values.

COURSE CODE : 16AU7001 COURSE NAME : ENGINE PERFORMANCE AND EMISSION TESTING LABORATORY	
CO1	Acquired the basic knowledge of different dynamometers, valve and port timing diagram.
CO2	Experiment with the Performance and emission Test on the multi cylinder CI and SI engines
CO3	Interpret the retardation test on IC engines
CO4	Develop heat balance and Morse test on multi cylinder petrol and diesel engines
CO5	Summarize the P-Θ and P-V Diagrams.

COURSE CODE : 16AU7002 COURSE NAME : VEHICLE MAINTENANCE LABORATORY

CO1	Able to describe the minor and major tuning of diesel and petrol engines
CO2	Able to dismantle, study, perform corrections and assemble the vehicle systems
CO3	Able to do the wheel alignment procedure and tyre removal procedure etc
CO4	Able to define the procedures of valve grinding, lapping, reboring calibration of fuel injection pump etc
CO5	At the end of the course the students will command over the fault finding, rectifying and maintenance of the automotive systems.

COURSE CODE : 16AU7701 COURSE NAME : INTERNSHIP TRAINING / IMPLANT TRAINING	
CO1	Acquire knowledge on real time industry expectation, operations and working environment

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SEMESTER VIII

COURSE CODE : 16AU8901 COURSE NAME : PROJECT WORK	
CO1	On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	COURSE OUTCOMES (COs)

PROFESSIONAL ELECTIVE I

COURSE CODE : 19AU5301 COURSE NAME : ALTERNATIVE FUELS AND ENERGY SYSTEMS	
CO1	Explain the availability of possible alternate fuels and their properties to use as fuel in CI and SI engines.
CO2	Justify the possible ways of using alcohols as a fuel in IC engines.

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CO3	Infer the challenges and difficulties in using vegetable oil as an alternative fuel in internal combustion engines.
CO4	Identify the uses of hydrogen as fuel in IC engines as an alternative for fossil fuels.
CO5	Relate the usefulness of natural acquiring gases towards IC engines.

COURSE CODE : 19AU5302 COURSE NAME : TYRE TECHNOLOGY	
CO1	Infer about the Functions of the pneumatic tyre
CO2	Explain the manufacturing process of different types of tyre
CO3	Relate the importance of Physical properties of tyre cords made of different fabric and Tyre structure, tyre shape, tread design and tyre size determination
CO4	Analyze about the tyre performance
CO5	Summarize about importance of tubes, flaps and retreading.

COURSE CODE : 19AU5303 COURSE NAME: AUTOMOTIVE MATERIALS AND MANUFACTURING TECHNOLOGY	
CO1	Identify the suitable material for automotive applications from the array of alloys.
CO2	Infer the surface treatment techniques used for enhancing the material properties.
CO3	Summarize about the latest materials used in automotive applications and its suitability.
CO4	Compare the methods involved in gear manufacturing, finishing and inspection.
CO5	Analyze the modern technologies involved in automotive components manufacturing.

COURSE CODE : 19AU5304 COURSE NAME: BATTERY TECHNOLOGY	
CO1	Infer about the Functions of the pneumatic tyre
CO2	Explain the manufacturing process of different types of tyre
CO3	Relate the importance of Physical properties of tyre cords made of different fabric and Tyre structure, tyre shape, tread design and tyre size determination
CO4	Analyze about the tyre performance
CO5	Summarize about importance of tubes, flaps and retreading.

COURSE CODE : 19AU5305 COURSE NAME: PLASTIC PARTS MANUFACTURING TECHNOLOGY	
CO1	Gain knowledge in selection, processing and thermoforming of polymers
CO2	Acquire the knowledge in Injection moulding processes and its implications.
CO3	Learn the various compression moulding techniques.

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CO4	Understand the procedures involved in polymer extrusion.
CO5	Get exposure in rapid tooling techniques and applications.

COURSE CODE : 19AU5306 COURSE NAME: COMPOSITE MATERIALS	
CO1	Classify different composite materials based upon their properties
CO2	Able to explain the methods employed in composite fabrication
CO3	Develop expertise on the applicable engineering design of composite
CO4	Identify and explain the types of composite materials and their characteristic features
CO5	Able to Select Material for Automobile Application

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COURSE OUTCOMES (COs)

PROFESSIONAL ELECTIVE II

COURSE CODE : 19AU6301 COURSE NAME : AUTOMOTIVE AIR-CONDITIONING	
CO1	Illustrate the components of the automotive air-conditioning and their fundamentals.
CO2	Describe the working principles of the components of the automotive air conditioning system
CO3	Understand air-conditioning controls, delivery system and refrigerants
CO4	Identify and describe the current developments relating to the automotive air conditioning
CO5	Infer the system servicing and testing

COURSE CODE : 19AU6302 COURSE NAME : FUEL CELL TECHNOLOGY	
CO1	Summarize the concepts, principle and working of fuel cells.
CO2	Comprehend the process design for fuel cells.
CO3	Assess the fuel processing techniques for fuel cells.
CO4	Interpolate the performance of various fuel cell components.
CO5	Paraphrasse the various automotive applications of fuel cells.

COURSE CODE : 19AU6303 COURSE NAME : ERGONOMICS IN AUTOMOTIVE DESIGN	
CO1	Design a sketch of automobile with new style.
CO2	Create clay models of the car and study the model.

CO3	Apply the basic techniques of ergonomics on vehicle design.
CO4	Acquire knowledge on designing passenger compartment.
CO5	Enumerate the steps and methods of vehicle interior design.

COURSE CODE : 19AU6304 COURSE NAME : ADDITIVE MANUFACTURING	
CO1	Understand the advanced manufacturing techniques evolved in rapid manufacturing scenario.
CO2	Access about liquid based solidification processes.
CO3	Gain knowledge in the various powder methodology processes.
CO4	Get exposure on the solid ground curing and 3D printing rapid manufacturing processes.
CO5	Know about the various rapid tooling techniques and applications.

COURSE CODE : 19AU6305 COURSE NAME: ROBOTICS	
CO1	Able to understand various manufacturing methods for different automobile components
CO2	Able to select the proper materials for various components of automobile
CO3	Utilize opportunities and challenges presented with automotive manufacturing in a global environment
CO4	Identify and explain the vehicle body components that are produced in a specific way to aid vehicle body repairs.
CO5	Apply and Analyze different materials and manufacturing methods that are used in automotive industry

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	COURSE OUTCOMES (COs)

PROFESSIONAL ELECTIVE III

COURSE CODE : 16AU7301 COURSE NAME : DESIGN OF JIGS, FIXTURES AND PRESS TOOLS	
CO1	Infer about the tool design procedures.
CO2	Design different jigs for manufacturing operations.
CO3	Develop the fixture designs for various production components.
CO4	Identify right techniques for press working operations.
CO5	Design the dies for required applications and processes.

COURSE CODE : 16AU7302 COURSE NAME : ENTERPRENEURSHIP DEVELOPMENT

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CO1	Upon completion of the course, students will Develop knowledge and skills needed to run a business successfully
CO2	Interpret the motivational concept in entrepreneurship development.
CO3	To impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.
CO4	Summarize the concept of financial and cost accounting
CO5	Compose the business strategy and skills to develop small scale industries.

COURSE CODE : 16AU7303 COURSE NAME : AUTOMOTIVE EMISSION AND POLLUTION CONTROL	
CO1	Upon the completion of the course, the student will Demonstrate the fundamentals of formation of automobile pollutions in IC Engines.
CO2	Demonstrate the fundamentals of formation of emission in SI Engines.
CO3	Demonstrate the fundamentals of formation of emission in CI Engines.
CO4	The student can Summarize the various pollution control techniques in automotive engines.
CO5	Experiment with the various methods of test procedures in automotive engines.

COURSE CODE : 16AU7304 COURSE NAME : ADVANCED THEORY OF IC ENGINES	
CO1	At the end of the course the students will command over the advancements in IC engines
CO2	Students will be familiar in fuel air cycles and their analysis
CO3	At the end of the course, the student can able to solve Governing Equations and perform combustion analysis with various operating conditions
CO4	Able to be familiar with combustion reactions, stiochiometry and non conventional IC engines
CO5	Able to evaluate performance and emission characteristics of engines

COURSE CODE : 16AU7305 COURSE NAME : VEHICLE DEALERSHIP MANAGEMENT	
CO1	Rephrase the basic concepts of dealership and their methods.
CO2	Demonstrate the contemporary showroom management
CO3	Apply a strategic perspective of the retailing industry
CO4	Apply the concept of management in parts ordering and servicing
CO5	Analyze the case study of vehicle dealership, service and showroom management

COURSE CODE : 16AU7306 COURSE NAME : OPERATION RESEARCH	
CO1	The students can able to use the optimization techniques for use engineering and Business problems

CO2	Apply linear programming model and assignment model to domain specific situations
CO3	Analyze the various methods under transportation model and apply the model for testing the closeness of their results to optimal results
CO4	Apply the concepts of PERT and CPM for decision making and optimally managing Projects
CO5	Analyze the various replacement and sequencing models and apply them for arriving at optimal decisions

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COURSE OUTCOMES (COs)

PROFESSIONAL ELECTIVE IV

COURSE CODE : 16AU7307 COURSE NAME : AUTOMOTIVE SENSOR AND EMBEDDED SYSTEMS	
CO1	Gain knowledge in transducer principles, sensors and measurement systems.
CO2	Know the theoretical and practical concepts of actuators.
CO3	Comprehend about embedded systems.
CO4	Utilize interrupts and timers in automotive field.
CO5	Perform the interfacing between sensors and pc.

COURSE CODE : 16AU7308 COURSE NAME : HYDRAULICS AND PNEUMATICS	
CO1	Understand the basic principles of hydraulics and pneumatics systems.
CO2	Design the various operational circuits with the knowledge of construction and operation of fluid power drives.
CO3	Identify, understand and draw fluid power symbols.
CO4	Design the application circuits of hydraulic and pneumatic systems.
CO5	Demonstrate the knowledge of fluid power systems with applications and advancements.

COURSE CODE : 16AU7309 COURSE NAME : TOTAL QUALITY MANAGEMENT	
CO1	Explain the different meanings of the quality concept and its influence.
CO2	Apply TQM principles and concepts of continuous improvement
CO3	Predict the errors in the measuring process, distinguishing its nature and the root causes.
CO4	Write reports to management describing processes and recommending ways to improve them
CO5	Explain the regulation and the phases of a quality system certification process.

COURSE CODE : 16AU7310 COURSE NAME : NON DESTRUCTIVE TESTING OF MATERIALS	
CO1	To have a basic knowledge of surface NDE techniques which enables to carry out various inspection in accordance with the established procedures
CO2	Differentiate various defect types and select the appropriate NDT methods for better evaluation.
CO3	Identify equipment required for the testing process
CO4	Ability to communicate their conclusions clearly to specialist and non-specialist audiences.
CO5	Documentation of the testing and evaluation of the results for further analysis.

COURSE CODE : 16AU7311 COURSE NAME: MICROPROCESSOR APPLICATION IN AUTOMOBILES	
CO1	Get an exposure to the increasing use of electronic circuitry in motor vehicle control systems.
CO2	Understand the microprocessor programming and interfacing.
CO3	Design application circuits with various interfacing devices in automotive sector.
CO4	Learn the microcontroller architecture, ports and programming.
CO5	Develop the microprocessor application which contributes to advances in vehicular safety, comfort and economy.

COURSE CODE : 16AU7312 COURSE NAME: VEHICLE BODY ENGINEERING	
CO1	Be familiar with different aspects of car body, bus body, types and commercial vehicle.
CO2	Able to know the role of various aerodynamic forces and moments and its measuring instruments
CO3	Understand the vehicle body regulation to build the body
CO4	Discover some new vehicle body and ergonomics designs
CO5	Know about the material used in body building, tools used, body repairs.

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PROFESSIONAL ELECTIVE V

COURSE CODE : 16AU8301 COURSE NAME : DESIGN FOR MANUFACTURE AND ASSEMBLY

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CO1	Understand the basic background of DFM and related concepts
CO2	Apply the fundamentals of GD &T in machining the components
CO3	Apply the concept of manufacturing and assembly to solve the industrial problem
CO4	To identify, quantify and eliminate waste or inefficiency in a product design
CO5	Explain the impact and importance of adopting integrated manufacturing systems in modern manufacturing.

COURSE CODE : 16AU8302 COURSE NAME : VEHICLE CONCEPT DESIGN AND STYLING	
CO1	Completion of this course the students will familiar in the design trends of concept cars with computer aided styling and new vehicle concept design and its technical illustration
CO2	Capable of design of concept cars based on aesthetic and ergonomics factors
CO3	Learners will be familiar in the field of computer aided styling
CO4	Improve learners creativity and convert into concept design and styling
CO5	Learners able to design a vehicle with their own idea

COURSE CODE : 16AU8303 COURSE NAME : OFF ROAD VEHICLES	
CO1	The students will understand the off road vehicles based on the need and purpose.
CO2	Learnt about off road vehicle special equipment
CO3	To develop the design concepts of off road vehicle special equipment
CO4	Learners able to handle the off road vehicle and its special equipment
CO5	Learners will be familiar in off road vehicle system and features

COURSE CODE : 16AU8304 COURSE NAME : ENGINE AUXILLARY SYSTEMS	
CO1	At the end of the course, the student will be familiar with the functionality, construction, working principle of carburetion.
CO2	Illustrate the electronics injection systems in automotive engines
CO3	Illustrate the diesel fuel injection systems in automotive engines
CO4	Students can Improve the Manifolds and Mixture Distribution in IC engine
CO5	Summarize the lubrication and cooling system in automotive engines.

COURSE CODE : 16AU8305 COURSE NAME : VEHICLE TROUBLESHOOTING AND MAINTENANCE	
CO1	Maintain the records and maintenance schedule.
CO2	Perform the engine maintenance procedures in vehicle breakdown situations.
CO3	Solve the problems normally arising in vehicular chassis components.
CO4	Evaluate the performance of the electrical systems of a vehicle.

CO5	Get an exposure to various new vehicles testing methods and standards for fuel, lubrication and cooling systems.

COURSE CODE : 16AU8306 **COURSE NAME : UNCONVENTIONAL MACHINING PROCESSES**	
CO1	Able to differentiate the machining processes that use different energies
CO2	Able to identify the process parameters, their effect and applications of different processes.
CO3	Select the best machining process for different materials to be processed
CO4	Apply and analyze the manufacturing processes to reduce the cost of the product
CO5	Solve problems related to tools, equipment and processes used in the industry

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	**COURSE OUTCOMES (COs)**

PROFESSIONAL ELECTIVE VI

COURSE CODE : 16AU8307 **COURSE NAME : SUPERCHARGING AND SCAVENGING**	
CO1	Demonstrate the fundamental philosophy of internal combustion engines.
CO2	Summarize the working principle of super chargers and their types
CO3	Summarize the need for supercharging and the various types of superchargers used and their performance characteristics and the scavenging methods for two stroke engines
CO4	Interpret the design of ports and mufflers
CO5	Analyze the Experimental methods for evaluating scavenging tests.

COURSE CODE : 16AU8308 **COURSE NAME : RELIABILITY CONCEPTS IN ENGINEERING**	
CO1	The student will be familiar with the basics of reliability and importance.
CO2	Apply the various methods to analysis the life of the product or component
CO3	Ability to calculate the estimated reliability period of the automotive element
CO4	Learners will be familiar with reliability management
CO5	Able to predict and maintain the economic life of the component

COURSE CODE : 16AU8309

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COURSE NAME : PRINCIPLES OF MANAGEMENT	
CO1	Interpret the concepts of management, administration and the evolution of management thoughts.
CO2	Choose and apply the planning concepts.
CO3	Analyze the different organizational structures and understand the staffing process
CO4	Analyze the various motivational and leadership theories and understand the communication and controlling processes.
CO5	Identify the various international approaches to management

COURSE CODE : 16AU8310 COURSE NAME: NEW GENERATION AND HYBRID VEHICLES	
CO1	Upon completion of this course the student will familiar in the recent development pertain to energy system.
CO2	Learnt about hybrid and electric drive trains
CO3	Understand the principles of automated vehicles
CO4	Able to familiar in advanced engine technologies.
CO5	Gain the knowledge in the field of advancement of safety systems

COURSE CODE : 16AU8311 COURSE NAME : PRODUCT DESIGN AND DEVELOPMENT	
CO1	Apply the process to plan and develop products
CO2	Analyze the process by collecting information and developing product specifications
CO3	Analyze the environmental issues that are involved in making a product and in retiring it.
CO4	Apply the concepts of product architecture, industrial design and design for manufacture
CO5	Apply the basics of prototyping, economic analysis and project planning and execution Processes for product development

COURSE CODE : 16AU8312 COURSE NAME : VEHICLE TRANSPORT MANAGEMENT	
CO1	Manage a transport fleet and their related activities with improved managerial skills.
CO2	Maintain the services with good relationship, good behavior and trustworthiness.
CO3	Improve the efficiency of goods transport with minimal operational cost.
CO4	Perform maintenance activities in time to avoid unnecessary downtime.
CO5	Know about the various transport laws and motor vehicle acts.

OPEN ELECTIVES(OE)

COURSE CODE : 19AU6401 COURSE NAME : BASICS OF AUTOMOBILE ENGINEERING	
CO1	Provides basic platform knowledge of automobile engineering
CO2	Understand the working principal of petrol and diesel engines
CO3	Interpret the method of power transmission unit
CO4	Built knowledge of steering and brake
CO5	Acquired the knowledge of automotive electrical systems and functioning

COURSE CODE : 16AU7401 COURSE NAME : AUTOMOTIVE SAFETY	
CO1	Acquire knowledge in automotive safety and importance
CO2	Able to analyze the safety concepts
CO3	Understand the various safety equipment functions and importance
CO4	Able to know the function of warning and avoidance systems
CO5	Acquire knowledge on various adjustment and measurement importance for comfort and convenience riding

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	CIVIL ENGINEERING
PROGRAMME NAME	B.E. CIVIL ENGINEERING
REGULATIONS	R2019

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO1	Excel as practicing engineers, academicians and researchers
PEO2	Play a vital role in the nation's infrastructural and sustainable development
PEO3	Hold professional and ethical responsibilities as engineers, consultants, entrepreneurs and pioneers while addressing the challenges of the society

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

PO 1	Engineering Knowledge: Apply the knowledge of Mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex civil engineering problems.
PO2	Problem Analysis: Identify, formulate, review research literature, and analyze complex civil engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design / Development of Solutions: Design solutions for complex civil 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 modeling 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 civil engineering practice.
PO7	Environment and Sustainability: Understand the impact of the professional civil 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 civil engineering practice.
PO 9	Individual and Teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex civil 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 civil engineering projects and in multidisciplinary environments.
PO12	Lifelong 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)

PROGRAM NAME – CIVIL ENGINEERING

Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSE CODE :21HE1101 COURSE NAME : TECHNICAL ENGLISH	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	Acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE :21MA1102 COURSE NAME : CALCULUS AND LINEAR ALGEBRA	
CO1	Apply the concept of differentiation in any curve
CO2	Identify the maximum and minimum values of surfaces
CO3	Apply double integrals to compute area of plane curves
CO4	Evaluation of triple integrals to compute volume of solids
CO5	Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies (or Eigen frequencies) of vibration and the shapes of these vibrational modes

COURSE CODE :21PH1151 COURSE NAME : APPLIED PHYSICS	
CO1	Illustrate the fundamental properties of matter
CO2	Discuss the Oscillatory motions of particles
CO3	Analyze the wavelength of different colors
CO4	Understand the advanced technology of LASER in the field of Engineering
CO5	Develop the technology of fiber optical communication in engineering field

COURSE CODE :21CY1151 COURSE NAME : CHEMISTRY FOR ENGINEERS	
CO1	Differentiate hard and soft water and to solve the related problems on water purification and its significance in industries and daily life
CO2	Acquire the basic knowledge of polymers, composites and FRP and their significance.

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CO3	Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences to minimize corrosion to improve industrial design.
CO4	Develop knowledge about the renewable energy resources and batteries along with the need of new materials to improve energy storage capabilities.
CO5	Identify the structure and characteristics of unknown/new compound with the help of spectroscopy.

COURSE CODE :21CS1151 **COURSE NAME : PYTHON PROGRAMMING AND PRACTICES**	
CO1	Develop algorithmic solutions to simple computational problems
CO2	Read, write, execute by hand simple Python programs
CO3	Structure simple Python programs for solving problems and Decompose a Python program into functions
CO4	Represent compound data using Python lists, tuples, dictionaries
CO5	Read and write data from/to files in Python Programs

COURSE CODE :21ME1152 **COURSE NAME : ENGINEERING DRAWING**	
CO1	Understand and interpret the engineering drawings in order to visualize the objects and draw the conics and special curves
CO2	Draw the orthogonal projections of straight lines and planes
CO3	Interpret the projections of simple solid objects in plan and elevation
CO4	Interpret the projections of simple solid objects in plan and elevation
CO5	Draw the isometric projections and the perspective views of different objects

COURSE CODE :21HE1071 **COURSE NAME : LANGUAGE COMPETENCY ENHANCEMENT COURSE- I**	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills

COURSE CODE : 21HE1072 **COURSE NAME : CAREER GUIDANCE LEVEL I**	
CO1	Enable students to approach learning Aptitude with ease, and understand recruiter expectation.

COURSE CODE : 21HE1073 **COURSE NAME : ENTREPRENEURSHIP AND INNOVATION**	
CO1	Understand the nature of business opportunities, resources, and industries in critical and creative aspects
CO2	Understand the processes by which innovation is fostered, managed, and commercialized

CO3	Remember effectively and efficiently the potential of new business opportunities
CO4	Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness
CO5	Develop a business model for a new venture, including revenue. Margins, operations, working capital, and investment

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COURSE OUTCOMES (COs)

PROGRAM NAME – CIVIL ENGINEERING

Upon the successful completion of the course, the students will be able to

SEMESTER II

COURSE CODE :21HE2101 **COURSE NAME : BUSINESS ENGLISH FOR ENGINEERS**	
CO1	To know different modes of business communication
CO2	To understand managerial techniques.
CO3	To apply the rules of grammar and vocabulary in effective business communication.
CO4	To analyze and interpret business documents.
CO5	To draft business reports

COURSE CODE :21MA2101 **COURSE NAME : DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLES**	
CO1	Apply few methods to solve different types of first order differential equations.
CO2	Solve Partial Differential Equations using various methods.
CO3	Infer the knowledge of construction of analytic functions and conformal mapping.
CO4	Evaluate real and complex integrals over suitable closed paths or contours.
CO5	Develop sound knowledge of techniques in solving ordinary differential equations

COURSE CODE : 21EE2103 **COURSE NAME : BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING**	
CO1	Apply the KVL and KCL in Electrical circuits.
CO2	Explain the constructional features of AC and DC machines

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CO3	Develop awareness on the methods for electrical safety, load protection basics
CO4	Identify electronics components and use them to design circuits
CO5	Develop combinational and sequential logic circuits

COURSE CODE :21ME2101 COURSE NAME : ENGINEERING MECHANICS	
CO1	Define and illustrate the basic concepts of force system
CO2	Identify the resultant force and couple, support reactions of the beam
CO3	Calculate the Centre of gravity and moment of inertia of an object
CO4	Examine the friction force of particles and objects for Impending Motion
CO5	Determine the displacement, velocity and acceleration of particles and objects

COURSE CODE : 21PH2151 COURSE NAME : MATERIAL SCIENCE	
CO1	Understand the purpose of acceptor or donor levels and the band gap of a semiconductor
CO2	Interpret the basic idea behind the process of magnetism and its applications in everyday
CO3	Discuss the behavior of super conducting materials
CO4	Illustrate the types and importance of crystal systems
CO5	Evaluate the production of ultrasonics and its applications in NDT

COURSE CODE : 21CY2151 COURSE NAME : ENVIRONMENTAL STUDIES	
CO1	Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
CO2	Understand the causes of environmental pollution and hazards due to manmade activities.
CO3	Develop an understanding of different natural resources including renewable resources.
CO4	Demonstrate an appreciation for need for sustainable development and understand the various Social issues and solutions to solve the issues.
CO5	Gain knowledge about the importance of women and child education and know about the existing technology to protect environment

COURSE CODE : 21ME2001 COURSE NAME : ENGINEERING PRACTICES	
CO1	Fabricate wooden components and pipe connections including plumbing works
CO2	Fabricate simple weld joints
CO3	Fabricate different electrical wiring circuits and understand the AC Circuits

COURSE CODE :21HE2071 COURSE NAME :LANGUAGE COMPETENCY ENHANCEMENT COURSE -II	
CO1	Introduced to different modes and types of communication.
CO2	Practiced to face and react to various professional situations efficiently.
CO3	learnt to practice managerial skills.
CO4	Familiarized with proper guidance to writing.
CO5	Trained to analyze and respond to different types of communication.

COURSE CODE : 21HE2072 COURSE NAME : CAREER GUIDANCE LEVEL II	
CO1	Enable students to solve questions on Verbal, Logical and Quantitative Aptitude of placement level

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COURSE OUTCOMES (COs)

PROGRAM NAME – CIVIL ENGINEERING

Upon the successful completion of the course, the students will be able to

SEMESTER III

COURSE CODE :19MA3103 COURSE NAME : FOURIER ANALYSIS AND NUMERICAL METHODS	
CO1	Understand the function in terms of sine and cosine terms in fourier series and also to get knowledge in fourier transforms
CO2	Demonstrate the application of Fourier series in solving the heat and wave equations
CO3	Understand the mathematical principles on Fourier transforms and able to solve some of the physical problems of engineering
CO4	Understand and apply the concepts of interpolation, numerical differentiation and integration
CO5	Understand the concept of solving ordinary differential equations using single and multi step methods

COURSE CODE : 19CE3201 COURSE NAME : MECHANICS OF FLUIDS	
CO1	Comprehend the properties of fluids
CO2	Understand the working of pressure measuring devices and measure fluid pressure
CO3	Distinguish between various types of fluid flows and find the fluid velocity and discharge using principles of Kinematics and Dynamics

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CO4	Identify the laminar and turbulent flow through pipes and compute the energy losses in pipe flow
CO5	Select appropriate model to provide solution to a real time problem related to hydraulics

COURSE CODE : 19CE3202 COURSE NAME : GEOLOGY AND CONSTRUCTION MATERIALS	
CO1	Understand the importance of geological knowledge in Civil Engineering
CO2	Identify the minerals present in the building materials
CO3	Characterize the engineering properties of rocks and soils
CO4	Distinguish and select the various construction materials used in concrete
CO5	Compare the typical and potential applications of other miscellaneous materials and finishes

COURSE CODE : 19CE3203 COURSE NAME : SURVEYING	
CO1	Apply the basic principles of surveying and levelling
CO2	Measure horizontal angle and vertical angle using theodolite
CO3	Take suitable precautions and apply necessary corrections in surveying
CO4	Apply principles of EDM and use total station in surveying
CO5	Interpret topographic maps and applications of GIS

COURSE CODE : 19CE3251 COURSE NAME : MECHANICS OF SOLIDS	
CO1	Realize the state of stresses and strains in structural components under tension, compression and shear
CO2	Plot the Shear force and bending moment diagrams for all the statically determinate beams
CO3	Analyse the beam for bending and shear stresses
CO4	Evaluate the elements subjected to complex state of stress by means of analytical and graphical methods.
CO5	Comprehend the behaviour of members under pure torsion and shear

COURSE CODE :19CE3001 COURSE NAME : SURVEY LAB	
CO1	Handle and operate the conventional surveying instruments such as chain, tape and compass to measure distances, angles and areas.
CO2	Carry out leveling operations and prepare a contour map of a given area.
CO3	Conduct experiment using compass, and total station to calculate the given area.
CO4	Use the theodolite to determine the horizontal and vertical angles.
CO5	Take measurements, adjust the errors and prepare a layout of a given area

COURSE CODE : 19CE3002 COURSE NAME : COMPUTER AIDED BUILDING DRAWING	
CO1	Apply the principles of planning and bye-laws for building planning
CO2	Prepare plan, elevation and section of residential buildings
CO3	Prepare plan, elevation and section of institutional and industrial buildings
CO4	Prepare detailed drawings of building component parts such as doors and windows
CO5	Efficiently plan and design buildings using BIM process

COURSE CODE :19MC3191 COURSE NAME : INDIAN CONSTITUTION	
CO1	Understand the functions of the Indian government.
CO2	Understand and abide the rules of the Indian constitution

COURSE CODE : 19HE3072 COURSE NAME : CAREER GUIDANCE LEVEL III	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

COURSE CODE : 19HE3073 COURSE NAME : LEADERSHIP MANAGEMENT SKILLS	
CO1	To practice essential leadership skills in day to day operations
CO2	To work on leadership skills in the study environment
CO3	To understand and develop the skills consciously.
CO4	To know about the real worth of all the skills for success
CO5	To Analyze the real worth of the person and suggestion for improvement

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COURSE OUTCOMES (COs)

PROGRAM NAME – CIVIL ENGINEERING

Upon the successful completion of the course, the students will be able to

SEMESTER IV

COURSE CODE : 19MA4103 COURSE NAME : PROBABILITY AND STATISTICS	
CO1	Understand the concepts of random variables
CO2	Express the phenomenon of two dimensional random variables

CO3	Compute correlation and predict unknown values using regression
CO4	Understand the concepts of statistical methods for testing the hypothesis
CO5	Apply Design of Experiment techniques to solve various engineering problems

COURSE CODE :19CE4201 COURSE NAME : STRENGTH OF MATERIALS	
CO1	Analyse the determinate trusses.
CO2	Determine the stresses developed in thin and thick cylinders subjected to fluid pressure.
CO3	Interpret the behaviour of short and long column under axial and eccentric loads.
CO4	Determine slope and deflection in beams using various methods.
CO5	Comprehend stresses in beams subjected to unsymmetrical bending.

COURSE CODE :19CE4202 COURSE NAME : APPLIED HYDRAULICS AND HYDRAULIC MACHINERY	
CO1	Classify open channel flows and plot the flow regimes.
CO2	Design the most economical sections for open channel flows
CO3	Analyse varied flows and interpret hydraulic jump phenomenon
CO4	Assess the performance of various types of turbines
CO5	Assess the performance of different pumps

COURSE CODE :19CE4203 COURSE NAME : SOIL MECHANICS	
CO1	Classify the soil based on index properties of soil
CO2	Assess the permeability characteristics of soil and calculate stress at any point in soil media due to load applied at a ground surface
CO3	Identify the stress distribution in soil, settlement problems occur in construction site
CO4	Apply the knowledge in carrying out soil testing
CO5	Analyze the stability of slope in cohesive and cohesion less soil by using different methods

COURSE CODE :19CE4251 COURSE NAME : CONCRETE TECHNOLOGY	
CO1	Understand the various requirements of cement, aggregates and water for making concrete.
CO2	Understand the effect of admixtures on properties of concrete
CO3	Design the concrete mix using ACI and IS code methods.
CO4	Determine the properties of fresh and hardened of concrete.
CO5	Understand the importance and application of special concretes.

COURSE CODE :19CE4001 COURSE NAME: SOIL MECHANICS LAB



CO1	Carry out specific field investigations to collect, test, observe and record the soil characteristics and its behavior.
CO2	Identify and classify soil based on standard geotechnical engineering practice.
CO3	Conduct tests to determine and demonstrate the index properties of soil.
CO4	Estimate compressive strength, shear strength, permeability and other engineering properties of soil
CO5	Assess and justify the suitability of soil for construction purposes based on test results.

COURSE CODE :19CE4002 **COURSE NAME : FLUID MECHANICS AND HYDRAULIC MACHINERY LAB**	
CO1	Measure discharge in pipes and channels.
CO2	Determine the major losses in pipes and conduits.
CO3	Demonstrate and plot the characteristic curves of pumps and turbines

COURSE CODE :19MC4191 **COURSE NAME : ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE**	
CO1	Ability to understand the structure of Indian system of life.
CO2	Connect up and explain basics of Indian Traditional knowledge in modern scientific perspective

COURSE CODE : 19HE4072 **COURSE NAME : CAREER GUIDANCE LEVEL IV**	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

COURSE CODE : 19HE4073 **COURSE NAME : IDEATION SKILLS**	
CO1	Develop a strong understanding and importance of ideation
CO2	Learn about the different kinds of tools for Ideation.
CO3	Learn the need and significance of prototyping and its significance

PROGRAM NAME – CIVIL ENGINEERING

Upon the successful completion of the course, the students will be able to

SEMESTER V

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COURSE CODE :19CE5201 COURSE NAME : STRUCTURAL ANALYSIS - I	
CO1	Determine the deflection of beams, trusses and frames by energy and unit load method
CO2	Analyse three hinged and two hinged parabolic arches
CO3	Analyse the continuous beams and rigid frames by slope defection method
CO4	Understand the concept of moment distribution and analysis of continuous beams and rigid frames with and without sway
CO5	Draw the influence lines for statically determinate structures

COURSE CODE :19CE5202 COURSE NAME: DESIGN OF RC ELEMENTS	
CO1	Illustrate the various design philosophies and design RC beam by working stress method
CO2	Design beams using limit state method under different loading and end conditions
CO3	Design slabs and staircases using limit state method
CO4	Design RC columns with different end conditions using limit state method
CO5	Select and design RC footing under various site conditions using limit state method

COURSE CODE :19CE5203 COURSE NAME : WATER SUPPLY ENGINEERING	
CO1	Understand the importance of water quality standards and forecast population to determine the rate of consumption
CO2	Interpret the various conveyance systems and its components
CO3	Classify and design the various components of the water treatment plant
CO4	Compare various advanced water treatment methods
CO5	Analyze distribution networks and assess the various systems of plumbing

COURSE CODE :19CE5204 COURSE NAME : FOUNDATION ENGINEERING	
CO1	Select the suitable method of site investigation based on the soil condition
CO2	Calculate the bearing capacity and settlement of shallow foundation
CO3	Comprehend the types and proportioning of footing
CO4	Estimate the pile load capacity
CO5	Understand retaining wall failure mechanisms and stability of retaining walls

COURSE CODE :19CE5205 COURSE NAME : HIGHWAY AND RAILWAY ENGINEERING

CO1	Understand different highway development programs, sight distance and IRC recommendations.
CO2	Design the flexible and rigid pavements by IRC method.
CO3	Identify and explain the various highway materials and pavement evaluation methods.
CO4	Plan and design the railway tracks.
CO5	Appreciate the need for modernization of tracks for speed trains.

COURSE CODE :19CE5001 COURSE NAME : CONCRETE AND HIGHWAY ENGINEERING LAB	
CO1	Interpret the properties of aggregates
CO2	Carry out various tests to determine flow properties of fresh concrete
CO3	Conduct tests to demonstrate and determine the strength of hardened concrete
CO4	Diagnose the properties of aggregates and bitumen using different testing methods
CO5	Assess the quality of the various constituents of concrete and draw inferences from the test results

COURSE CODE :19CE5002 COURSE NAME : SURVEY CAMP	
CO1	Carry out various surveying works based on actual field conditions
CO2	Conduct different types of setting out works
CO3	Follow the standard operating procedure when measuring an area using total station
CO4	Perform topographical surveying and prepare the topographical map of an area
CO5	Establish horizontal and vertical control network using total station

COURSE CODE :19HE5071 COURSE NAME : SOFT SKILLS - I	
CO1	Students will have clarity on their career exploration process and to match their skills and interests with a chosen career path
CO2	Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others
CO3	Students will understand how teamwork can support leadership skills
CO4	Students will be able to make sense of problems, develop strategies to find solutions, and persevere in solving them
CO5	Students will demonstrate an enhanced ability to draw logical conclusions and implications to solve logical problems

COURSE CODE :19HE5072 COURSE NAME : DESIGN THINKING	
CO1	Develop a strong understanding of the Design Process
CO2	Learn to develop and test innovative ideas through a rapid iteration cycle.

CO3	Develop teamwork and leadership skills

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	**COURSE OUTCOMES (COs)**

PROGRAM NAME – CIVIL ENGINEERING

Upon the successful completion of the course, the students will be able to

SEMESTER VI

COURSE CODE :19CE6201 **COURSE NAME : STRUCTURAL ANALYSIS - II**	
CO1	Determine the member forces and displacements for trusses and analyse beams and frames by flexibility method
CO2	Analyse beams and frames by stiffness matrix method
CO3	Understand the different elements of a structure using finite element method
CO4	Analyse the beams and frames by plastic analysis
CO5	Appraise the structural behavior of cable and space structures

COURSE CODE :19CE6202 **COURSE NAME : DESIGN OF STEEL STRUCTURAL ELEMENTS**	
CO1	Gain knowledge on the limit state concepts and design connections
CO2	Design tension members
CO3	Design compression members
CO4	Design beams, plate girders, stiffeners and web splice
CO5	Design the components of steel trusses, purlins and gantry girders

COURSE CODE :19CE6203 **COURSE NAME : WASTEWATER ENGINEERING**	
CO1	Estimate the quantity of sewage produced and ascertains the type of sewerage system
CO2	Design the sewers and select the sewer materials
CO3	Determine the characteristics of sewage and design the unit operations
CO4	Understand the principle of operation and design various biological treatment processes
CO5	Interpret the various options for sewage disposal and sludge management

COURSE CODE :19CE6204 **COURSE NAME : CONSTRUCTION MANAGEMENT**	
CO1	Learn the requirement of planning techniques exercised in the construction projects

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CO2	Choose suitable scheduling technique for the particular project
CO3	Interpret the modern cost account systems and control techniques adopted in the construction projects
CO4	Make use of advanced management tools for quality control and monitoring techniques towards speedy and guaranteed projects
CO5	Comprehend the aspects of management information system

COURSE CODE :19CE6001 COURSE NAME : WATER AND WASTEWATER TESTING LAB	
CO1	Collect, store, preserve and characterize water and wastewater samples based on requirements
CO2	Illustrate the significance of characterization of water, wastewater and BIS water quality and effluent standards
CO3	Conduct experiments to determine the various physical, chemical and biological characteristics of water and wastewater samples
CO4	Demonstrate, analyze and measure the required water quality parameters using advanced instrumentation methods
CO5	Compare and check the determined results with IS / WHO standards

COURSE CODE : 19CE6002 COURSE NAME : DESIGN AND DRAWING OF RC STRUCTURES	
CO1	Design and prepare structural drawings of Cantilever Retaining walls
CO2	Design and prepare structural drawings of Counter-fort Retaining wall
CO3	Design and prepare structural drawings of T beam Bridge
CO4	Design and prepare structural drawings of Circular water tank with dome
CO5	Design and prepare structural drawings of Underground water tank

COURSE CODE :19HE6071 COURSE NAME : SOFT SKILLS – II	
CO1	Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict
CO2	Students will Actively participate meetings, Group Discussions / interviews and prepare & deliver presentations
CO3	Students will define professional behavior and suggest standards for appearance, actions and attitude in a Business environment
CO4	Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems
CO5	Students will excel in complex reasoning

COURSE CODE :19HE6072 COURSE NAME : INTELLECTUAL PROPERTY RIGHTS	
CO1	Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP
CO2	Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development

CO3	Identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing
CO4	Identify different types of trademarks and procedure for registration
CO5	Recognize the concept of design, geographical indication and procedure for registration

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)**

DEPARTMENT NAME	CIVIL ENGINEERING
PROGRAMME NAME	CIVIL
REGULATIONS	R2016

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO1	Excel as practicing engineers, academicians and researchers
PEO2	Play a vital role in the nation's infrastructural and sustainable development
PEO3	Hold professional and ethical responsibilities as engineers, consultants, entrepreneurs and pioneers while addressing the challenges of the society

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

PO1	Engineering Knowledge: Apply the knowledge of Mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex civil engineering problems.
PO2	Problem Analysis: Identify, formulate, review research literature, and analyze complex civil engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex civil 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 modeling 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

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	cultural issues and the consequent responsibilities relevant to the professional civil engineering practice.
PO7	Environment and sustainability: understand the impact of the professional civil 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 civil 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 civil 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 civil engineering projects and in multidisciplinary environments.
PO12	Lifelong 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.

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COURSE OUTCOMES (COs)

PROGRAM NAME – CIVIL ENGINEERING

Upon the successful completion of the course, the students will be able to

SEMESTER VII

COURSE CODE : 16CE7201 COURSE NAME : ESTIMATION, COSTING AND VALUATION ENGINEERING	
CO1	Produce a detailed estimated report considering the building plan and additional amenities.
CO2	To do rate analysis based on the knowledge gained from schedule of rates
CO3	Specify the importance of detailed and general specifications.
CO4	Calculate depreciation and estimate the value of the building.
CO5	Prepare a detailed report with accurate specification and values.

COURSE CODE : 16CE7202 COURSE NAME: CONCRETE TECHNOLOGY	
CO1	Identify the detailed significance of each ingredient in concrete.
CO2	Design the concrete mix as per codal provisions.
CO3	Determine the properties of fresh and hardened concrete.
CO4	Categorize and suggest special concretes for various applications.
CO5	Propose proper mixing and placing techniques for concrete.

COURSE CODE : 16CE7203 COURSE NAME : IRRIGATION AND HYDRAULIC STRUCTURES	
CO1	Compare the various methods of irrigation and estimate the optimum water requirement.
CO2	Apply the principles and theories for the design of diversion headworks.
CO3	Compute the forces, analyse and design gravity dams.
CO4	Compare and contrast the construction techniques and failure mechanisms of arch, buttress and earth dams.
CO5	Design the various units of canal regulation works.

COURSE CODE : 16CE7001 COURSE NAME: DESIGN AND DRAWING –II(IRRIGATION & ENVIRONMENTAL ENGINEERING	
CO1	Understand the principles and function of various components of irrigation and environmental engineering structures.

CO2	Read the drawings and visualize the various components and its dimensions of irrigation and environmental engineering structures.
CO3	Design the various components of irrigation engineering structures.
CO4	Draft the plan, elevation and sectional views of irrigation and environmental engineering structures.
CO5	Incorporate the design results and dimensions while preparing the drawings of irrigation and environmental engineering structures.

COURSE CODE : 16CE7002 COURSE NAME : DESIGN PROJECT	
CO1	Upon successful completion of the course, students will have better experience in designing the various structures / components / processes related to Civil Engineering.

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COURSE OUTCOMES (COs)

PROGRAM NAME – CIVIL ENGINEERING

Upon the successful completion of the course, the students will be able to

SEMESTER VIII

COURSE CODE : 16CE8201 COURSE NAME : STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING	
CO1	Understand the theory of vibrations and determine response of structures.
CO2	Evaluate the magnitude and interpret the intensity of earthquake.
CO3	Discuss the elements of seismology and implement the guide lines for the design of seismic resistant construction.
CO4	Include the principles of the response spectra and design spectra in the design of earthquake resistant structures
CO5	Identify and incorporate the various techniques used to design Earthquake Resistant Structures

COURSE CODE :16CE8901 COURSE NAME : PROJECT WORK	
CO1	On the completion of the project work, students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

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PROGRAM NAME – CIVIL ENGINEERING

Upon the successful completion of the course, the students will be able to

PROFESSIONAL ELECTIVE I

COURSE CODE : 19CE5301 COURSE NAME : ADVANCED SURVEYING TECHNIQUES	
CO1	Understand the concepts of astronomical surveying
CO2	Understand the importance of photogrammetric surveying
CO3	Comprehend and apply the principles of Total Station Surveying
CO4	Interpret the principles of GPS surveying and data processing
CO5	Compare the concepts of route survey, hydrographic survey and tunnel alignments

COURSE CODE : 19CE5302 COURSE NAME : TRAFFIC ENGINEERING	
CO1	Apply knowledge of traffic, its components and factors affecting road traffic in intersection design
CO2	Apply the knowledge of sampling data in conducting various surveys and analysis
CO3	Understand traffic movements and designing islands, intersections and road lightings
CO4	Interpret the causes, effects and prevention of road accidents
CO5	Comprehend the traffic regulations and techniques

COURSE CODE : 19CE5303 COURSE NAME : HOUSING PLANNING AND MANAGEMENT	
CO1	Interpret the technical terms in relation with housing policy and project
CO2	Comprehend and understand the specifications and plan of various housing programmes
CO3	Handle the planning and design of various housing projects
CO4	Use the cost effective techniques and materials to reduce the project cost
CO5	Perform financial appraisal of housing projects

COURSE CODE : 19CE5304

COURSE NAME : CONSTRUCTION TECHNIQUES, EQUIPMENT AND SAFETY	
CO1	Understand the techniques used in construction industry.
CO2	Enumerate the various equipments used in construction.
CO3	Recognize and construction practices in construction industry.
CO4	Identify and incorporate the safety practices in construction.
CO5	Comprehend the techniques of sub-structure and super-structure construction

COURSE CODE : 19CE5305 COURSE NAME : HYDROLOGY	
CO1	Emphasize the importance of hydrometerology.
CO2	Evaluate the precipitation potential and analyse precipitation data.
CO3	Plot and analyse flood hydrographs
CO4	Estimate the yield and losses in aquifers
CO5	Comprehend the methods of flood routing based on flood frequency studies.

COURSE CODE : 19CE5306 COURSE NAME: PROFESSIONAL ETHICS AND LAWS FOR CIVIL ENGINEERS	
CO1	Integrate professional ethics and human values in their work environment
CO2	Interpret the social experimentation techniques and contract laws in engineering
CO3	Recognize and enforce their professional rights and responsibilities in the field of engineering
CO4	Assess the risks in an engineering project and propose suitable safety measures
CO5	Identify the global issues in engineering and the need for corporate social responsibilities

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST
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COURSE OUTCOMES (COs)

PROGRAM NAME – CIVIL ENGINEERING

Upon the successful completion of the course, the students will be able to

PROFESSIONAL ELECTIVE II

COURSE CODE : 19CE6301 COURSE NAME : BUILDING SERVICES	

CO1	Illustrate and design the electrical supply systems, systems of wiring and protective electrical installations included in buildings
CO2	Identify and incorporate the concepts of illumination and its principles while designing the lighting system of a building
CO3	Understand the principles of ventilation and air conditioning in the design of buildings
CO4	Compare the various fire safety systems and devices
CO5	Gain knowledge on the importance of plumbing, drainage and rain water harvesting systems involved in buildings

COURSE CODE : 19CE6302 COURSE NAME : AIRPORTS, DOCKS AND HARBOUR ENGINEERING	
CO1	Understand the components of aircraft and airport characteristics
CO2	Illustrate the various components and zones of an airport layout
CO3	Interpret the design principles of Runway and Taxiway
CO4	Differentiate the various components of docks and Harbour
CO5	Comprehend the various coastal structures and costal protection regulations

COURSE CODE : 19CE6303 COURSE NAME : SUBSURFACE INVESTIGATION AND FIELD TESTING	
CO1	Select the suitable method of exploration and geophysical methods
CO2	Understand various exploration techniques
CO3	Comprehend the various sampling techniques
CO4	Interpret the various field tests in soil exploration
CO5	Interpret the principles applications of various instruments in soil engineering

COURSE CODE : 19CE6304 COURSE NAME : GROUNDWATER ENGINEERING	
CO1	Interpret the various hydro-geological parameters and GEC norms
CO2	Estimate the yield of groundwater from a source based on the data given
CO3	Illustrate the various physical and mathematical models of groundwater management
CO4	Understand the importance of groundwater quality and its environmental concerns
CO5	Compare and contrast the various recharge techniques for groundwater conservation

COURSE CODE : 19CE6305 COURSE NAME : ARCHITECTURE AND TOWN PLANNING	
CO1	Acknowledge the basic elements and principles of design in architecture
CO2	Apply the layout design concepts and regulations while designing a building

CO3	Integrate the principles of anthropometry, safety standards and basic building services in building design
CO4	Incorporate the climatic design principles and green building concepts in building design
CO5	Consider the principles of town planning; zoning regulations and landscaping while planning a building

COURSE CODE : 19CE6306 COURSE NAME : DISASTER PREPAREDNESS AND PLANNING	
CO1	Comprehend and understand the types of disasters
CO2	Handle the planning and design of various disaster risk reduction
CO3	Identify and incorporate the safety practices disasters and development
CO4	Gain knowledge on disaster risk management in India
CO5	Illustrate the various components disaster management

COURSE CODE : 19CE6401 COURSE NAME : REMOTE SENSING AND GIS	
CO1	Illustrate the principles of remote sensing and its components
CO2	Compare and interpret the characteristics and processing techniques of remote sensing imagery
CO3	Classify the various types of data and database systems involved in GIS
CO4	Comprehend the various processes related to data analysis and modeling in GIS
CO5	Understand the applications of remote sensing and GIS in various field of engineering

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST
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COURSE OUTCOMES (COs)

PROGRAM NAME – CIVIL ENGINEERING

Upon the successful completion of the course, the students will be able to

PROFESSIONAL ELECTIVE III

COURSE CODE : 16CE7301 COURSE NAME : AIR POLLUTION MANAGEMENT	
CO1	Recognize the different sources of air pollution and predict the impacts.
CO2	Interpret the dispersion of pollutants based on meteorological conditions.
CO3	Propose suitable control equipment for various air pollutants.

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CO4	Apply the regulatory requirements for air quality monitoring and town planning.
CO5	Categorize the sources and suggest control measures for indoor air pollution and noise pollution.

COURSE CODE : 16CE7302 COURSE NAME : ENVIRONMENTAL IMPACT ASSESSMENT	
CO1	Summarize the need for EIA, its development, capabilities and limitations.
CO2	Demonstrate the EIA methods.
CO3	Assess the impacts on the environment.
CO4	Implement Environmental Management Systems in development projects.
CO5	Comprehend and prepare EIA report based on case studies.

COURSE CODE : 16CE7303 COURSE NAME : MUNICIPAL SOLID WASTE MANAGEMENT	
CO1	Classify solid waste and determine the effects of poor waste management on public health and the environment
CO2	Assess the options for source reduction of wastes and suggest suitable methods for on-site storage and processing.
CO3	Determine the manpower requirement, collection techniques and transport methodologies of solid waste.
CO4	Compare various techniques of off-site processing and their effectiveness.
CO5	Evaluate the various options for disposal of wastes and their selection criteria.

COURSE CODE : 16CE7304 COURSE NAME : HAZARDOUS WASTE MANAGEMENT AND SITE REMEDIATION	
CO1	Classify and categorize hazardous waste and illustrate the impacts of hazardous waste and need of hazardous waste management.
CO2	Propose the various components of hazardous waste management system.
CO3	Summarize the sources, characteristics, impacts and treatment of nuclear and E wastes.
CO4	Summarize the sources, characteristics, impacts and treatment of biomedical and chemical
CO5	Incorporate scientific approaches to the design and construction of landfills and recommend appropriate site remediation techniques.

COURSE CODE : 16CE7305 COURSE NAME : INDUSTRIAL WASTEWATER ENGINEERING	
CO1	Characterize industrial wastewater and propose methods for prevention and control based on regulatory requirements.
CO2	Schematize various treatment options for industrial wastewater.

CO3	Recommend various advanced treatment methods for industrial wastewater.
CO4	Comprehend and Analyse the industrial wastewater generation, characteristics and treatment based on case studies.
CO5	Comprehend and Analyse the industrial wastewater generation, characteristics and treatment based on case studies

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COURSE OUTCOMES (COs)

PROGRAM NAME – CIVIL ENGINEERING

Upon the successful completion of the course, the students will be able to

PROFESSIONAL ELECTIVE IV

COURSE CODE : 16CE7306 **COURSE NAME : DESIGN OF MASONRY AND TIMBER STRUCTURES**	
CO1	Classify structures and employ suitable method of design.
CO2	Design and detailmasonry column and walls.
CO3	Analyze and design laterally loaded masonry structures.
CO4	Adopt earthquake resistant design with masonry structures.
CO5	Workout the design of timber Structures.

COURSE CODE : 16CE7307 **COURSE NAME : DISASTER RESISTANT STRUCTURES**	
CO1	Comprehend the codal provisions to analyse and design disaster resistant structures.
CO2	Predict response of different community structures and assess their reliability.
CO3	Propose rehabilitation and retrofitting options.
CO4	Suggest modern materials and analysis for disaster resistant design.
CO5	Assess the damages and suggest suitable maintenance techniques and modifications to improve hazard resistance

COURSE CODE : 16CE7308 **COURSE NAME : TALL BUILDINGS**	
CO1	Gain knowledge about various materials and design criteria.
CO2	Understand the codal provisions of design loads.
CO3	Identify the different structural systems and its behaviour
CO4	Analysis and design the structural elements.
CO5	Evaluate the importance of stability requirements both on sub structure and super structure.

COURSE CODE : 16CE7309 COURSE NAME : FINITE ELEMENT TECHNIQUES	
CO1	Comprehend the concepts and methods of Finite Element Analysis.
CO2	Formulate the stiffness matrix of the elements.
CO3	Be conversant with the concepts of Finite element analysis for one and two dimensional problems.
CO4	Relate the Isoparametric elements with its formulation.
CO5	Employ finite element methods for various applications.

COURSE CODE : 16CE7310 COURSE NAME : PREFABRICATED STRUCTURES	
CO1	Comprehend the principles and concepts of prefabrication.
CO2	Categorize the various prefabricated element and know their jointing details
CO3	Design of the connections and joints of prefabricated structures.
CO4	Analyse and design structural units for various prefabricated structures
CO5	Comprehend the production methods of prefabricated elements.

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PROGRAM NAME – CIVIL ENGINEERING

Upon the successful completion of the course, the students will be able to

PROFESSIONAL ELECTIVE V

COURSE CODE :16CE8301 COURSE NAME : COMPUTER AIDED DESIGN OF STRUCTURES	
CO1	Justify the applications of hardware and software components in design.
CO2	Implement the modeling concepts of graphic standards.
CO3	Apply principles of structural analysis and finite element analysis and formulate stiffness matrix.
CO4	Optimize the design of structural elements with all stability requirements.
CO5	Employ expert systems for various applications.

COURSE CODE :16CE8302 COURSE NAME : DESIGN OF INDUSTRIAL STRUCTURES	
CO1	Evaluate the planning requirements for industries.
CO2	Sort out functional requirements for industries.
CO3	Design industrial structures with steel.
CO4	Design industrial structures with RCC.

CO5	Workout the design of Power Transmission Structures.

COURSE CODE :16CE8303 COURSE NAME : DESIGN OF PRESTRESSED CONCRETE STRUCTURES	
CO1	Incorporate the basic fundamentals of prestressing in civil engineering.
CO2	Design prestressed concrete flexural members.
CO3	Apply the design concept of prestressed concrete tanks and pipes.
CO4	Evaluate the performance of composite members.
CO5	Design pretensioned and prestressed concrete bridges.

COURSE CODE :16CE8304 COURSE NAME :REPAIR AND REHABILITATION OF STRUCTURES	
CO1	Recollect the facets and importance of maintenance and also know how to evaluate a damaged building.
CO3	Suggest special concretes for various applications.
CO4	Interpret the principles of non-destructive testing and implement the latest techniques in the repair and corrosion protection methods.
CO5	Recommend suitable techniques for repair, rehabilitation and retrofitting of structures.

COURSE CODE : 16CE8305 COURSE NAME : VALUATION OF LAND AND BUILDINGS	
CO1	Employ the fundamental principles of valuation while evaluating a property.
CO2	Apply the various theories and concepts of valuation when evaluating a land.
CO3	Compare and contrast the various methods of valuation of immovable properties.
CO4	Work out the net present value and estimate the cost of buildings.
CO5	Estimate the rent and depreciation values of various properties.

PROGRAM NAME – CIVIL ENGINEERING

Upon the successful completion of the course, the students will be able to

PROFESSIONAL ELECTIVE VI

COURSE CODE : 16CE8306 COURSE NAME : GROUNDWATER ENGINEERING	
CO1	Comprehend the various hydrogeological parameters.
CO2	Be conversant with well hydraulics and estimate the yield of aquifers.
CO3	Interpret the groundwater quality in relation to health and aesthetic aspects.
CO4	Apply various models for groundwater management.
CO5	Suggest and adopt suitable groundwater conservation techniques.

COURSE CODE : 16CE8307 COURSE NAME : INTEGRATED WATER RESOURCES MANAGEMENT	
CO1	Incorporate the concept of IWRM process.
CO2	Implement the economic characteristics of water and services
CO3	Know the concept of Health protection and promotion in the context of IWRM
CO4	Access the irrigation efficiencies, irrigation methods and current water pricing.
CO5	Understand the importance of development of IWRM in line with legal and regulatory framework

COURSE CODE :16CE8308 COURSE NAME : ROCK ENGINEERING	
CO1	Classify rocks and comment on index properties of rocks
CO2	Determine the rock strength and evaluate the rock failure mechanisms
CO3	Estimate the stresses in rocks and describe techniques for measurement..
CO4	Apply rock mechanics in engineering.
CO5	Comprehend the installation of rock bolts.

COURSE CODE :16CE8309 COURSE NAME : GROUND IMPROVEMENT TECHNIQUES	
CO1	Interpret the geotechnical problem and select suitable method for ground improvement.

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CO2	Implement drainage and dewatering techniques for improving the properties of soil
CO3	Apply the concepts of insitu treatment methods for ground improvement
CO4	Select and use a suitable geosynthetic material for various functions.
CO5	Employ suitable grouting techniques and other soil stabilization methods for ground improvement.

COURSE CODE :16CE8310 COURSE NAME : EARTH RETAINING STRUCTURES	
CO1	Consider various theories, cases and methods to calculate the earth pressure.
CO2	Take into account the various soil parameters and design the retaining structures.
CO3	Analyze and design sheet pile walls and cofferdams.
CO4	Compare and contrast the various types of supported excavation, soil anchors and conduits.
CO5	Analyze and design the reinforced earth retaining structures.

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COURSE OUTCOMES (COs)

PROGRAM NAME – CIVIL ENGINEERING

Upon the successful completion of the course, the students will be able to

OPEN ELECTIVE

COURSE CODE : 19CE6301 COURSE NAME : BUILDING SERVICES	
CO1	Illustrate and design the electrical supply systems, systems of wiring and protective electrical installations included in buildings
CO2	Identify and incorporate the concepts of illumination and its principles while designing the lighting system of a building
CO3	Understand the principles of ventilation and air conditioning in the design of buildings
CO4	Compare the various fire safety systems and devices
CO5	Gain knowledge on the importance of plumbing, drainage and rain water harvesting systems involved in buildings

COURSE CODE : 16CE7402 COURSE NAME : GREEN BUILDINGS

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CO1	Incorporate the concepts of green building and reduce carbon foot print.
CO2	Identify and compare cost and performance of building materials with recycled components, materials with low embodied energy and salvaged materials and incorporate them into design.
CO3	Integrate the importance of green building strategies and science in construction.
CO4	Understand the techniques and benefits of building monitoring and metering and also identify and compare the existing energy codes with green building codes and rating systems.
CO5	Recognize and demonstrate methods for green remodeling and management and green rating system compliance.

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	COMPUTER SCIENCE AND ENGINEERING
PROGRAMME NAME	B.E
REGULATIONS	R2019

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO 1	To acquire knowledge in the latest technologies and innovations and an ability to identify
PEO 2	To be capable of modeling, designing, implementing and verifying a computing system to meet specified requirements for the benefit of society.
PEO 3	To possess critical thinking, communication skills, teamwork, leadership skills and ethical behavior necessary to function productively and professionally

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

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 modeling to complex engineering activities

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	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.

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COURSE OUTCOMES (COs)

PROGRAM NAME – B.E COMPUTER SCIENCE ENGINEERING

Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSE CODE: 21HE1101 COURSE NAME: TECHNICAL ENGLISH	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	Acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE: 21MA1101 COURSE NAME: CALCULUS	
CO1	Apply the concept of differentiation in any curve.
CO2	Evaluation of infinite series approximations for problems arising in mathematical modeling.
CO3	Identify the maximum and minimum values of surfaces.
CO4	Apply double integrals to compute area of plane curves.
CO5	Evaluation of triple integrals to compute volume of solids

COURSE CODE: 21PH1151 COURSE NAME: APPLIED PHYSICS	
CO1	Illustrate the fundamental properties of matter
CO2	Discuss the Oscillatory motions of particles
CO3	Analyze the wavelength of different colors
CO4	Understand the advanced technology of LASER in the field of Engineering
CO5	Develop the technology of fiber optical communication in engineering field

COURSE CODE: 21CY1151 COURSE NAME: CHEMISTRY FOR ENGINEERS	
CO1	Differentiate hard and soft water and to solve the related problems on water purification and its significance in industries and daily life
CO2	Acquire the basic knowledge of polymers, composites and FRP and their significance.
CO3	Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences to minimize

	corrosion to improve industrial design.
CO4	Develop knowledge about the renewable energy resources and batteries along with the need of new materials to improve energy storage capabilities.
CO5	Identify the structure and characteristics of unknown/new compound with the help of spectroscopy.

COURSE CODE: 21CS1151 COURSE NAME: PYTHON PROGRAMMING AND PRACTICES	
CO1	Develop algorithmic solutions to simple computational problems
CO2	Read, write, execute by hand simple Python programs
CO3	Structure simple Python programs for solving problems and Decompose a Python program into functions
CO4	Represent compound data using Python lists, tuples, dictionaries
CO5	Read and write data from/to files in Python Programs.

COURSE CODE: 21EC1154 COURSE NAME: BASICS OF ELECTRON DEVICES AND ELECTRIC CIRCUITS	
CO1	Apply network theorems for AC and DC Circuits.
CO2	Understand the concept of transient response of circuits.
CO3	Ability to explain the theory, construction, and operation of diodes and BJT.
CO4	Ability to explain the theory, construction, and operation of FET and special semiconductor diodes.
CO5	Ability to apply the methods to ensure electrical safety.

COURSE CODE: 21HE1071R COURSE NAME: LANGUAGE COMPETENCY ENHANCEMENT COURSE - I	
CO1	Trained to maintain coherence and communicate effectively
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world
CO4	acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE: 21HE1072 COURSE NAME: CAREER GUIDANCE LEVEL I	
CO1	Enable students to approach learning Aptitude with ease, and understand recruiter expectation.

COURSE CODE: 21HE1073 COURSE NAME: ENTREPRENEURSHIP & INNOVATION	
CO1	Understand the nature of business opportunities, resources, and industries in critical and creative aspects.
CO2	Understand the processes by which innovation is fostered, managed, and commercialized.
CO3	Remember effectively and efficiently the potential of new business

	opportunities.
CO4	Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness..
CO5	Develop a business model for a new venture, including revenue. Margins, operations, working capital, and investment.

COURSE CODE: 21CS1152 **COURSE NAME: OBJECT ORIENTED PROGRAMMING USING PYTHON**	
CO1	Understanding the basic concepts to read, write and execute simple python programs.
CO2	Apply the conditional and looping concepts for solving problems.
CO3	Apply functions to decompose larger complex programs.
CO4	Understanding the OOPS concepts and writing programs using classes and objects.
CO5	Understand to read and write data from/to files in Python Programs.

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	**COURSE OUTCOMES (COs)**

PROGRAM NAME – B.E COMPUTER SCIENCE ENGINEERING

Upon the successful completion of the course, the students will be able to

SEMESTER II

COURSE CODE : 21HE2101 **COURSE NAME: BUSINESS ENGLISH FOR ENGINEERS**	
CO1	Introduced to different modes and types of business communication.
CO2	Practiced to face and react to various professional situations efficiently.
CO3	Learnt to practice managerial skills.
CO4	Familiarized with proper guidance to business writing.
CO5	Trained to analyze and respond to different types of communication.

COURSE CODE: 21MA2104 **COURSE NAME: DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA**	
CO1	Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies
CO2	Infer the knowledge of vector spaces
CO3	Apply few methods to solve different types of first order differential equations.
CO4	Develop sound knowledge of techniques in solving ordinary differential equations.

CO5	Solve Partial Differential Equations using various methods.

COURSE CODE: 21PH2151 **COURSE NAME: MATERIAL SCIENCE**	
CO1	Understand the purpose of acceptor or donor levels and the band gap of a semiconductor.
CO2	Interpret the basic idea behind the process of magnetism and its applications in everyday.
CO3	Discuss the behavior of super conducting materials.
CO4	Illustrate the types and importance of crystal systems.
CO5	Evaluate the production of ultrasonics and its applications in NDT.

COURSE CODE :21CY2151 **COURSE NAME: ENVIRONMENTAL STUDIES**	
CO1	Develop an understanding of different natural resources including renewable resources.
CO2	Realise the importance of ecosystem and biodiversity for maintaining ecological balance.
CO3	Understand the causes of environmental pollution and hazards due to manmade activities.
CO4	Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues.
CO5	Gain knowledge about the importance of women and child education and know about the existing technology to protect environment.

COURSE CODE: 21CS2152 **COURSE NAME: ESSENTIALS OF C AND C++ PROGRAMMING**	
CO1	Able to develop simple applications in C using basic constructs.
CO2	Able to apply solutions to real world problems using basic characteristics of C++.
CO3	Able to write object-oriented programs using operator overloading, constructors and destructors.
CO4	Able to develop programs with the concepts of inheritance and polymorphism.
CO5	Able to understand and define solutions with C++ advanced features such as templates and exception handling.

COURSE CODE : 21ME2154 **COURSE NAME: ENGINEERING GRAPHICS**	
CO1	Understand and interpret the engineering drawings in order to visualize the objects and draw the conics and special curves.
CO2	Draw the orthogonal projections of straight lines and planes.
CO3	Interpret the projections of simple solid objects in plan and elevation.
CO4	Draw the projections of section of solids and development of surfaces of solids.

CO5	Draw the isometric projections and the perspective views of different objects.

COURSE CODE : 21ME2001 COURSE NAME : ENGINEERING PRACTICES	
CO1	Fabricate wooden components and pipe connections including plumbing works.
CO2	Fabricate simple weld joints.
CO3	Fabricate different electrical wiring circuits and understand the AC Circuits.

COURSE CODE : 21HE2071R COURSE NAME : LANGUAGE COMPETENCY ENHANCEMENT COURSE - II	
CO1	Introduced to different modes and types of communication
CO2	Practiced to face and react to various professional situations efficiently.
CO3	Learnt to practice managerial skills.
CO4	Familiarized with proper guidance to writing.
CO5	Trained to analyze and respond to different types of communication

COURSE CODE : 21HE2072 COURSE NAME : CAREER GUIDANCE LEVEL - II	
CO1	Enable students to solve questions on Verbal, Logical and Quantitative Aptitude of placement level

COURSE CODE : 21CS2153 COURSE NAME : JAVA FUNDAMENTALS	
CO1	Understanding the OOPS and basic concepts of Java.
CO2	Understand how to program using user defined packages and interfaces.
CO3	Apply multithreading concepts based on appropriate problems.
CO4	Understand generics and collections framework in java
CO5	Apply event handling classes and swing concepts to create different applications in java

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST
HICET

COURSE OUTCOMES (COs)

SEMESTER III

HINDUSTHAN COLLEGE OF ENGG & TECH ★ CBE-32 ★

COURSE CODE: 19MA3104 COURSE NAME: DISCRETE MATHEMATICS AND GRAPH THEORY	
CO1	Evaluate the notion of mathematical thinking, mathematical proofs, and algorithmic thinking and be able to apply them in problem solving.
CO2	Solve problems using counting techniques and recurrence relations.
CO3	Understand the knowledge about Lattices and Boolean Algebra.
CO4	Apply the properties of graphs and related discrete structures in computer networks.
CO5	Analyze the various types of trees and their properties.

COURSE CODE: 16CS3201 COURSE NAME: DATA STRUCTURES	
CO1	Develop applications in C using pointers, structures and unions.
CO2	Acquire knowledge the most common abstractions for data collections (e.g., stacks, queues, lists).
CO3	Use nonlinear data structures such as trees to solve problems. .
CO4	Apply Algorithms for solving problems like sorting and searching.
CO5	Apply Graph algorithms to find the shortest path cost.

COURSE CODE: 19CS3202 COURSE NAME: DATABASE MANAGEMENT SYSTEMS	
CO1	Understand the functional components of DBMS and datamodels
CO2	Able to write SQL queries
CO3	Analyze a system and design ER diagram and Relational Schema
CO4	Able to perform normalization and write queries using normalization criteria
CO5	Illustrate the concepts for transaction processing, concurrency control and recovery procedures for RDBMS.

COURSE CODE: 19CS3203 COURSE NAME: COMPUTER ARCHITECTURE	
CO1	Understand the basics structure of computers, operations and instructions
CO2	Practice the arithmetic operations performed by ALU.
CO3	Design and analyze pipeline for consistent execution of instructions with hazards.
CO4	Explain the structure of parallel processing architectures
CO5	Demonstrate knowledge about state-of-the-art I/O, memory, Interrupts and Interfaces

COURSE CODE: 19CS3251 COURSE NAME: DIGITAL PRINCIPLES AND SYSTEM DESIGN	
CO1	Simplify Boolean functions using different methods
CO2	Analyse, design and implement combinational logic circuits
CO3	Analyse, design and implement Synchronous sequential logic circuits
CO4	Analyse, design and implement Asynchronous sequential logic circuits

CO5	Simulate and implement combinational and sequential circuits using HDL

COURSE CODE: 19CS3001 COURSE NAME: DATA STRUCTURES LABORATORY	
CO1	Apply good programming design methods for program development.
CO2	Apply the different data structures for implementing solutions to practical problems.
CO3	Develop recursive programs using trees and graphs.

COURSE CODE: 19CS3002 COURSE NAME: DATABASE MANAGEMENT SYSTEMS LABORATORY	
CO1	Use typical data definitions and manipulation commands
CO2	Design applications to test Nested and Join Queries
CO3	Implement simple applications that use Views
CO4	Critically analyze the use of Tables, Views, Functions and Procedures
CO5	Implement applications that require a Front-end Tool

COURSE CODE : 19AC3191 COURSE NAME : INDIAN CONSTITUTION	
CO1	Understand the functions of the Indian government.
CO2	Understand and abide the rules of the Indian constitution.

COURSE CODE : 19HE3072 COURSE NAME : CAREER GUIDANCE LEVEL III	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

COURSE CODE: 19HE3073 COURSE NAME: LEADERSHIP MANAGEMEN SKILLS	
CO1	To practice essential leadership skills in day to day operations
CO2	To work on leadership skills in the study environment
CO3	To understand and develop the skills consciously.
CO4	To know about the real worth of all the skills for success
CO5	To Analyze the real worth of the person and suggestion for improvement

COURSE CODE: 19CS3253 COURSE NAME: CLEAN CODING AND DEVOPS	
CO1	Understand the importance of comments in the applications.
CO2	Understand the data and object antisymmetric
CO3	Understand Cloud computing concepts
CO4	Explain why DevOps on cloud and various DevOps services available on IBM Cloud

HICET

COURSE OUTCOMES (COs)

SEMESTER IV

COURSE CODE: 19CS4201 COURSE NAME: JAVA PROGRAMMING	
CO1	To Understand the Basics of java Programming
CO2	Design program using user defined packages and interfaces
CO3	Develop applications using multithreading concepts in java
CO4	Design real time applications using generics and collection frameworks.
CO5	Apply event handling classes and swing concepts to create different applications in java

COURSE CODE: 19CS4202 COURSE NAME: SOFTWARE ENGINEERING	
CO1	Compare different process models.
CO2	Concepts of requirements engineering and Analysis Modeling.
CO3	Apply systematic procedure for software design and deployment.
CO4	Compare and contrast the various testing and maintenance.
CO5	Manage project schedule, estimate project cost and effort required.

COURSE CODE: 19CS4203 COURSE NAME: OPERATING SYSTEMS	
CO1	Design various Scheduling algorithms.
CO2	Design deadlock, prevention and avoidance algorithms.
CO3	Compare and contrast various memory management schemes.
CO4	Design and implement a prototype file system.
CO5	Study the distributed operating systems.

COURSE CODE: 19MA4151 COURSE NAME: PROBABILITY, STATISTICS AND QUEUEING THEORY	
CO1	Understand the concepts of random variables.
CO2	Express the phenomenon of two-dimensional random variables.
CO3	Compute correlation and predict unknown values using regression together with R studio.
CO4	Understand the concepts of statistical methods for testing the hypothesis along with R studio.
CO5	Identify the queuing models in the given system, analyze the result.

COURSE CODE: 19CS4251 COURSE NAME: DESIGN AND ANALYSIS OF ALGORITHM	
CO1	Design algorithms for various computing problems

CO2	Analyze the time and space complexity of algorithms
CO3	Critically analyze the different algorithm design techniques for a given problem
CO4	Modify existing algorithms to improve efficiency
CO5	Apply algorithm techniques for real time applications.

COURSE CODE: 19CS4001 COURSE NAME: JAVA PROGRAMMING LAB	
CO1	Understand the basics of Java Programming
CO2	Design program using Inheritance, interface and exception handling techniques.
CO3	Develop applications using multithread programming.
CO4	Implement data structure concepts using Generic programs and collection classes.
CO5	Design real time applications using Event handling and Swing.

COURSE CODE: 19CS4002 COURSE NAME: OPERATING SYSTEMS LAB	
CO1	Apply the basic Unix commands and shell concepts in real time.
CO2	Compare the performance of various CPU Scheduling Algorithms and file allocation strategies.
CO3	Create programs using system calls.
CO4	Analyze the performance of the various page replacement algorithms
CO5	Develop process synchronization using semaphore.

COURSE CODE: 19AC4191 COURSE NAME: VALUE EDUCATION - ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	
CO1	Ability to understand the structure of Indian system of life.
CO2	Connect up and explain basics of Indian Traditional knowledge in modern scientific perspective.
CO3	Understanding the holistic life style of yoga.
CO4	Understanding the tradition of philosophy.
CO5	Understanding the Indian linguistic and artistic tradition.

COURSE CODE: 19HE4072 COURSE NAME: CAREER GUIDANCE LEVEL IV	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays

COURSE CODE: 19HE4073 COURSE NAME: IDEATION SKILLS	
CO1	Ability to understand the structure of Indian system of life.
CO2	Connect up and explain basics of Indian Traditional knowledge in modern scientific perspective.
CO3	Understanding the holistic life style of yoga.

CO4	Understanding the tradition of philosophy.
CO5	Understanding the Indian linguistic and artistic tradition.

COURSE CODE: 19CS4204 COURSE NAME: DATA VISUALIZATION	
CO1	Know the history of data visualization and its connection with computer graphics.
CO2	Students understand the foundations and characteristics of data, which forms the beginning of the visualization pipeline.
CO3	Understand the role of user interaction within visualizations, understand the visualization design process.
CO4	Students know some commercial data visualization packages with functionality.

COURSE CODE: 19CS4003 COURSE NAME: DATA VISUALIZATION LABORATORY	
CO1	Know the history of data visualization and its connection with computer graphics
CO2	Students understand the foundations and characteristics of data, which forms the beginning of the visualization pipeline
CO3	Understand the role of user interaction within visualizations, understand the visualization design process.
CO4	Students know some commercial data visualization packages with functionality.

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	COURSE OUTCOMES (COs)

SEMESTER V

COURSE CODE: 19CS5201 COURSE NAME: THEORY OF COMPUTING	
CO1	Understand the theoretical concepts of automata and equivalence of automata
CO2	Remember the automata in applying to obtain regular expressions and languages
CO3	Apply the normalization in context free grammar to obtain optimized CFG
CO4	Understand PDA and turing machines and apply for making mathematical models
CO5	Understand the decidability and tractability problems and apply for developed models

COURSE CODE: 19CS5202

COURSE NAME: COMPUTER NETWORKS	
CO1	Learn about the Protocol Layering and Physical Level Communication
CO2	Understand the Data Communication System and the purpose of Layered Architecture.
CO3	Analyze the concepts of Routing Methods and Subnetting.
CO4	Design protocols for various functions in the Network.
CO5	Understand the functions and Protocols of the Transport Layer.

COURSE CODE: 19CS5203 COURSE NAME: DATA MINING	
CO1	Develop understanding level in basic mining concepts and techniques
CO2	Develop skills using data mining OLAP and Weka tools
CO3	Enhance knowledge in mining software for solving practical problems
CO4	Represent concepts of data preprocessing
CO5	Read and write own mining algorithms and concepts for research.

COURSE CODE: 19EC5231 COURSE NAME: PRINCIPLES OF MICROPROCESSORS AND MICRO CONTROLLERS	
CO1	Design and implement programs on 8086 microprocessor.
CO2	Design I/O circuits.
CO3	Design Memory Interfacing circuits.
CO4	Design and implement 8051 microcontroller based systems.
CO5	Design various interfacing and its programming methodologies

COURSE CODE: 19CS5252 COURSE NAME: OBJECT ORIENTED ANALYSIS AND DESIGN	
CO1	Express software design with UML diagrams
CO2	Design software applications using OO concepts.
CO3	Identify various scenarios based on software requirements.
CO4	Transform UML based software design into pattern based design using design patterns
CO5	Understand the various testing methodologies for OO software

COURSE CODE: 19EC5031 COURSE NAME: PRINCIPLES OF MICROPROCESSORS AND MICROCONTROLLERS LABORATORY	
CO1	Write ALP Programmes for Arithmetic Operations
CO2	Write ALP for arithmetic and logical operations in 8086 and 8051
CO3	Generate waveforms using Microprocessors. CO4: Execute Programs in 8051
CO4	Explain the difference between simulator and Emulator
CO5	Write ALP Programmes for Arithmetic Operations

COURSE CODE: 19HE5071 COURSE NAME: SOFT SKILLS - I	
CO1	Students will have clarity on their career exploration process and to

	match their skills and interests with a chosen career path.
CO2	Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others
CO3	Students will understand how teamwork can support leadership skills
CO4	Students will be able to make sense of problems, develop strategies to find solutions, and persevere in solving them.
CO5	Students will demonstrate an enhanced ability to draw logical conclusions and implications to solve logical problems.

COURSE CODE: 19HE5072 **COURSE NAME: DESIGN THINKING**	
CO1	Develop a strong understanding of the Design Process
CO2	Learn to develop and test innovative ideas through a rapid iteration cycle.
CO3	Develop teamwork and leadership skills

COURSE CODE: 19CS6181 **COURSE NAME: PRINCIPLES OF MANAGEMENT**	
CO1	Understand the functions and responsibilities of managers.
CO2	Interpret the planning, policies, various tools and techniques.
CO3	Solve organizational problems and develop optimal managerial decisions.
CO4	Importance of proper vocabularies to articulate ones own position and communicate effectively.
CO5	Grasp both qualitative and quantitative information and formulate best control methods.

COURSE CODE: 19CS6201 **COURSE NAME: ARTIFICIAL INTELLIGENCE**	
CO1	Understand the various characteristics of Intelligent agents
CO2	Learn the different search strategies in AI
CO3	Learn to represent knowledge in solving AI problems
CO4	Understand the different ways of designing software agents
CO5	Learn about the various applications of AI.

COURSE CODE: 19CS6202 **COURSE NAME: MOBILE COMPUTING**	
CO1	Understand the various characteristics of Intelligent agents
CO2	Learn the different search strategies in AI
CO3	Learn to represent knowledge in solving AI problems
CO4	Understand the different ways of designing software agents
CO5	Learn about the various applications of AI.

COURSE CODE: 19CS6251R **COURSE NAME: COMPILER DESIGN**	
CO1	Learn the design principles of a Compiler.

CO2	Learn about the Lexical analysis.
CO3	Learn about Syntax analysis.
CO4	Apply the concepts for syntax directed translation and run time environment.
CO5	Apply the concepts of code optimization and code generation.

COURSE CODE: 19CS6001R COURSE NAME: MOBILE APPLICATION DEVELOPMENT LABORATORY	
CO1	Develop mobile applications using GUI and Layouts.
CO2	Develop mobile applications using Event Listener.
CO3	Develop mobile applications using Databases.
CO4	Develop mobile applications using RSS Feed, Internal/External Storage, SMS, Multi-threading and GPS.
CO5	Analyze and discover own mobile app for simple needs.

COURSE CODE: 19HE6071 COURSE NAME: SOFT SKILL-II	
CO1	Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict.
CO2	Students will Actively participate meetings, Group Discussions / interviews and prepare & deliver presentations
CO3	Students will define professional behavior and suggest standards for appearance, actions and attitude in a Business environment
CO4	Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.
CO5	Students will excel in complex reasoning.

COURSE CODE: 19HE6072 COURSE NAME: INTELLECTUAL PROPERTY RIGHTS (IPR)	
CO1	Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.
CO2	Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.
CO3	Identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing.
CO4	Identify different types of trademarks and procedure for registration
CO5	Recognize the concept of design, geographical indication and procedure for registration

PROFESSIONAL ELECTIVE I

COURSE CODE: 19CS5351 COURSE NAME: INTERNET AND WEB TECHNOLOGY	
CO1	Understand the concepts of OOP paradigm.
CO2	Understand the basics of world wide web.

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CO3	Understand the Principles behind the design and construction of Web applications.
CO4	Apply the concepts of JDBC.
CO5	Understand about server side programming.

COURSE CODE: 19CS5352 COURSE NAME: ADVANCED JAVA PROGRAMMING	
CO1	To make use of GUI concepts in java programs.
CO2	Use the methods of network programming to create an application.
CO3	To make the students to develop distributed business applications and multitier applications
CO4	To develop web pages using advanced server-side programming through servlets and JDBC.
CO5	To use bean concepts for developing enterprise application.

COURSE CODE: 19CS5353 COURSE NAME: FUNDAMENTALS OF OPEN SOURCE SOFTWARE	
CO1	Understand open source operating systems and application.
CO2	Develop MYSQL query.
CO3	Develop PHP program with database connection.
CO4	Create a python program using exception.
CO5	Develop a python application using database.

COURSE CODE: 19CS5354 COURSE NAME: R PROGRAMMING	
CO1	Understand the fundamentals of R Programming.
CO2	Design the program using R functions and R String.
CO3	Develop the application using R packages and R files.
CO4	Understand and design the application using R database and R charts.
CO5	Design the application using R linear & non linear regression, R distribution.

COURSE CODE: 19CS5355 COURSE NAME: COMPUTER GRAPHICS AND MULTIMEDIA	
CO1	Apply various algorithms to scan, convert the basic geometrical primitives and area filling.
CO2	Apply two dimensional transformations and clipping techniques to graphics
CO3	Learn the basic concepts of 3D object representation, transformations and projection.
CO4	Apply the concepts of color models, lighting and shading models, textures, ray tracing, hidden surface elimination and rendering to graphics objects.
CO5	Learn about the basics of multimedia concepts.

PROFESSIONAL ELECTIVE II

COURSE CODE: 19CS6301 COURSE NAME: BUSINESS INTELLIGENCE – DATA WAREHOUSING AND ANALYTICS	
CO1	Understand difference between Transaction Processing and Analytical applications and describe the need for Business Intelligence
CO2	Demonstrate to understand technology and processes associated with Business Intelligence framework
CO3	Demonstrate to understand Data Warehouse implementation methodology and project life cycle
CO4	Formulate given a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal
CO5	Demonstrate application of concepts using open source/MS Office

COURSE CODE: 19CS6302 COURSE NAME: EMBEDDED SYSTEMS	
CO1	Understand the architecture and programming of ARM processor.
CO2	Understand and remember the concepts of embedded computing platform design and analysis.
CO3	Understand the basic concepts of real time Operating system design.
CO4	Apply the system design techniques to develop software for embedded systems.
CO5	Apply the embedded-system concepts to develop the real time applications.

COURSE CODE: 19CS6303 COURSE NAME: INTERNET OF THINGS	
CO1	Explain the concept of IoT and various building blocks
CO2	Understand various architectures and working of state-of-the-art IoT systems
CO3	Design IoT system using Rasperry Pi
CO4	Apply data analytics related to IoT and evaluate security issues related to the Internet of Things
CO5	Analyze applications of IoT in real time scenario.

COURSE CODE: 19CS6304 COURSE NAME: BIG DATA ANALYTICS AND TOOLS	
CO1	Better understanding to work with big data tools and its analysis techniques
CO2	Explore about various tools and practices for working with big data
CO3	Learn about stream computing and its importance
CO4	Understand about the applications and researches in integration of large amounts of data
CO5	Apply the logics of security in handling large amount of data

COURSE CODE: 19CS6305 COURSE NAME: SOFT COMPUTING	
CO1	Apply various soft computing concepts for practical applications.

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CO2	Choose and design suitable neural network for real time problems.
CO3	Explain the importance of optimization techniques and neural networks.
CO4	Use fuzzy rules and reasoning to develop decision making and expert system.
CO5	Review the various hybrid soft computing techniques and apply in real time problems.

OPEN ELECTIVE

COURSE CODE: 19CS6401 **COURSE NAME: INTRODUCTION TO JAVA PROGRAMMING**	
CO1	Understand basic Java programs with concepts
CO2	Develop Java programs using OOP principles and inheritance
CO3	Develop Java programs with the concepts interfaces
CO4	Build Java applications using exceptions and I/O streams
CO5	Develop Java applications with threads and generic classes

COURSE CODE: 19CS6402 **COURSE NAME: GREEN COMPUTING**	
CO1	Knowledge about the fundamentals of Green Computing
CO2	Enhance the skill in energy saving practices in their use of hardware.
CO3	Analyze the Green computing Grid Framework
CO4	Understand the issues related with Green compliance.
CO5	Understand and develop various case studies

HICET	PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	COMPUTER SCIENCE AND ENGINEERING
PROGRAMME NAME	B.E
REGULATIONS	R2016

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO 1	To acquire knowledge in the latest technologies and innovations and an ability to identify
PEO 2	To be capable of modeling, designing, implementing and verifying a computing system to meet specified requirements for the benefit of society.
PEO 3	To possess critical thinking, communication skills, teamwork, leadership skills and ethical behavior necessary to function productively and professionally

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

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 modeling 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.



HICET

COURSE OUTCOMES (COs)

SEMESTER VII

COURSE CODE: 16CS7201 COURSE NAME: CRYPTOGRAPHY AND NETWORK SECURITY	
CO1	Able to design and conduct experiments to analyze and interpret data.
CO2	Able to use Cryptography in different fields of Engineering and Mathematics.
CO3	Able to analyze and select a suitable Cipher for an application.
CO4	Able to use the best solution for a threat.
CO5	Able to analyze the system level security.

COURSE CODE: 16CS7202 COURSE NAME: CLOUD COMPUTING	
CO1	Understanding the knowledge about the state-of-the-art in distributed-systems architectures.
CO2	Understanding the various service delivery models of a cloud computing architecture.
CO3	Understanding the performance, scalability, and availability of the underlying cloud technologies and software.
CO4	Understanding the Identify security and privacy issues in cloud computing.
CO5	Understanding the ways in which the cloud can be programmed and deployed

COURSE CODE: 16CS7203 COURSE NAME: MOBILE COMPUTING	
CO1	Understand the basics of mobile telecommunication system.
CO2	Understand the features of mobile IP and TCP-IP.
CO3	Understand the various telecommunication systems.
CO4	Apply adhoc based routing and security mechanisms.
CO5	Apply the knowledge gained and build a Mobile Application using the software development kit.

COURSE CODE: 16CS7001 COURSE NAME: CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY	
CO1	Apply various cipher techniques
CO2	Apply and develop the various security algorithms

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CO3	Apply the different open-source tools for network security and analysis

COURSE CODE: 16CS7002 COURSE NAME: CLOUD COMPUTING LABORATORY	
CO1	Understand the Basic Requirements of cloud
CO2	Use the cloud infrastructure tool kits
CO3	Design and implement applications on the Cloud Infrastructure
CO4	Design and implement applications on the cloud security.
CO5	Implement the Concept of Cloud Services

COURSE CODE : 16CS7310 COURSE NAME: ARTIFICIAL INTELLIGENCE	
CO1	Apply the characteristics of AI that make it useful to real -world problems.
CO2	Apply the different searching techniques.
CO3	Understand the domain knowledge representation in propositional and first-order logic.
CO4	Understand the planning process of various state-space search algorithms, and choose the appropriate algorithm for a problem.
CO5	Apply the different techniques for learning and reasoning under uncertainty.

COURSE CODE: 16CS7311 COURSE NAME: HIGH SPEED NETWORKS	
CO1	Understand various concepts of high-speed networks.
CO2	Understand different types of congestion control mechanisms and traffic management.
CO3	Understand the concepts of integrated and differentiated services.
CO4	Understand various protocols for QOS support.
CO5	Understand the concepts of . wireless network operations and functions

ELECTIVE – III

COURSE CODE: 16CS7301 COURSE NAME: C# AND .NET PROGRAMMING	
CO1	To learn the basics of .net Frame work and C# language.
CO2	To learn C# elements and OOPS concepts.
CO3	To learn interface and inheritance concepts in C# language.
CO4	To learn fundamentals of window application programming and create a window application.
CO5	To develop web applications and learn advanced features of C#.

COURSE CODE: 16CS7302 COURSE NAME: BIOMETRICS

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CO1	CO1: Demonstrate knowledge of the basic physical and biological science and engineering principles underlying biometric systems.
CO2	CO2: Understand and analyze biometric systems at the component level and be able to analyze and design basic biometric system applications.
CO3	CO3: Be able to work effectively in teams and express their work and ideas orally and in writing.
CO4	CO4: Identify the sociological and acceptance issues associated with the design and implementation of biometric systems.
CO5	CO5: Understand various Biometric security issues.

COURSE CODE: 16CS7303 **COURSE NAME: E-COMMERCE**	
CO1	Understand the importance of E-commerce, network infrastructure and apply the knowledge of E-commerce in various E-business models.
CO2	Remember the concepts of switching networks and understand the basic markup languages for client server communication.
CO3	Understand the concepts of Electronic Data Interchange, its standardizations and apply the acquired knowledge of EDI into internet-based Data Exchange.
CO4	Understand the security standards, techniques of internet-based payment systems and apply the concepts in business-oriented E-commerce applications.
CO5	Understand the notion of intelligent agents and apply it in web-based marketing, web advertisements to handle web design issues.

COURSE CODE: 16CS7304 **COURSE NAME: WIRELESS SENSOR NETWORKS**	
CO1	Explain the concepts, network architectures and applications of ad hoc and wireless sensor networks.
CO2	Analyze the protocol design issues of ad hoc and sensor networks
CO3	Design routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues
CO4	Evaluate the QoS related performance measurements of WIRE LESS sensor networks
CO5	Introduced to some existing applications of wireless sensor actuator networks

COURSE CODE: 16CS7305 **COURSE NAME: DATA MINING AND WAREHOUSING**	
CO1	Enable students to understand and implement classical algorithms in data mining and data warehousing.
CO2	students will be able to assess the strengths and weaknesses of the algorithms.
CO3	To identify the application area of algorithms, and apply them.
CO4	Students would learn data mining techniques as well as methods in integrating and interpreting the data sets
CO5	To improve effectiveness, efficiency and quality for data analysis.

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COURSE CODE: 16CS7306 COURSE NAME: DIGITAL SIGNAL PROCESSING	
CO1	Perform frequency transforms for the signals
CO2	To implement DFTs using Fast Fourier Transforms
CO3	Design IIR filters
CO4	Design FIR filters
CO5	Learn the architecture details and instruction sets of fixed and floating point DSPs

ELECTIVE - IV

COURSE CODE: 16CS7307 COURSE NAME: TEXT MINING	
CO1	Identify the different features that can be mined from text and web documents
CO2	Use available open source classification and clustering tools on some standard text data sets
CO3	Modify existing classification/clustering algorithms in terms of functionality or features used
CO4	Design a system that uses text mining to improve the functions of an existing open source search engine
CO5	Implement a text mining system that can be used for an application of your choice

COURSE CODE: 16CS7308 COURSE NAME: SOFT COMPUTING	
CO1	Demonstrate different types of artificial neural networks.
CO2	Explain the concept of fuzzy systems.
CO3	Summarize the various special networks.
CO4	Develop the solutions using genetic algorithms.
CO5	Develop application using soft computing techniques

COURSE CODE: 16CS7309 COURSE NAME: HUMAN INTERFACE SYSTEM DESIGN	
CO1	Describe the basic fundamentals of the HISD.
CO2	Examine the various aspects of managing human interface design.
CO3	Describe the various aspects involved in virtual environment and manipulation.
CO4	Identify various interfaces available.
CO5	Describe the web page and communicate other resource

COURSE CODE: 16CS7310 COURSE NAME: ARTIFICIAL INTELLIGENCE	
CO1	Apply the characteristics of AI that make it useful to real -world problems.
CO2	Apply the different searching techniques

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CO3	Understand the domain knowledge representation in propositional and first-order logic
CO4	Understand the planning process of various state-space search algorithms, and choose the appropriate algorithm for a problem.
CO5	Apply the different techniques for learning and reasoning under uncertainty

COURSE CODE: 16CS7311 COURSE NAME: HIGH SPEED NETWORKS	
CO1	Understand various concepts of high-speed networks.
CO2	Understand different types of congestion control mechanisms and traffic management.
CO3	Understand the concepts of integrated and differentiated services.
CO4	Understand various protocols for QOS support
CO5	Understand the concepts of wireless network operations and functions

COURSE CODE: 16CS7312 COURSE NAME: SEMANTIC WEB	
CO1	Able to understand semantic web basics, architecture and technologies
CO2	Able to represent data from a chosen problem in XML with appropriate semantic tags obtained or derived from the ontology
CO3	Able to understand the semantic relationships among these data elements using Resource Description Framework (RDF)
CO4	Able to design and implement a web services application that "discovers" the data and/or other web services via the semantic web.
CO5	Able to discover the capabilities and limitations of semantic web technology for social networks

ELECTIVE-V

COURSE CODE: 16CS8301 COURSE NAME: SOFTWARE PROJECT MANAGEMENT	
CO1	Describe project evaluation and planning
CO2	Explain project life cycle and effort estimation.
CO3	Discuss activity planning and risk management
CO4	Analyze project management and control.
CO5	Able to practice Project Management principles while developing a software

COURSE CODE: 16CS8302 COURSE NAME: WEB TECHNOLOGY	
CO1	Explore the internet related technologies and hierarchy of objects in XHTML, CSS and Social media.
CO2	Design dynamic and interactive web pages by embedding Java Script code in XHTML.
CO3	Implement server side programming and build web applications using PHP.
CO4	Develop the interactive web applications using ASP.NET.

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CO5	Build and consume web services.

COURSE CODE: 16CS8303 COURSE NAME: PERVASIVE COMPUTING	
CO1	Learn the basics of pervasive computing and recent developments
CO2	Knowledge about various Human Computer interaction devices
CO3	Exposure on various connectivity models
CO4	Get idea on WAP technology and the working mechanism
CO5	Study of different architecture of PDA devices

COURSE CODE: 16CS8304 COURSE NAME: DATABASE SECURITY AND PRIVACY	
CO1	Knowledge about secure OS and Architecture
CO2	Exposure of security privileges and policies for database
CO3	Study of virtual database and security model
CO4	Various auditing and management activities
CO5	To learn different mining methods involved in securing database

COURSE CODE: 16CS8305 COURSE NAME: R PROGRAMMING	
CO1	Explain the basic concepts of R.
CO2	Illustrate exploratory data analysis with R.
CO3	Summarize the use of graphics in R.
CO4	Compare the different statistical models in R.
CO5	Demonstrate the use of advanced concepts in R

COURSE CODE: 16CS8306 COURSE NAME: DATABASE TUNING	
CO1	Understanding the recovery system and security of Database system
CO2	Analyze normalization and tuning for various data formats
CO3	Exposure to real time tuning process
CO4	Study various querying methods and improvements in tuning
CO5	Knowledge about application that used for tuning database system

COURSE CODE: 16CS8307 COURSE NAME: VISUAL PROGRAMMING	
CO1	To Understand the Basics of Windows Programming
CO2	To Develop applications using Visual Basic
CO3	To Develop applications using Visual C++ Programming
CO4	To Understand the visual C++ menus and SDI MDI environments
CO5	To develop the applications of Visual C++Programming

COURSE CODE: 16CS8308 COURSE NAME: SOFTWARE TESTING	
CO1	Understand the fundamental concepts in software testing, including definition, principles, roles and defects

CO2	Understand the strategies for software testing and understand black box and white box testing methods
CO3	Apply various levels of software testing for software project.
CO4	Understand the issues in testing management and understand test planning
CO5	Apply the test measurements and Reviews for software testing

COURSE CODE: 16CS8309 COURSE NAME: HIGH PERFORMANCE COMPUTING	
CO1	Identify the Modern Processors and concepts
CO2	Discuss the various concepts of Optimizations
CO3	Analyze the parallel computers and programming
CO4	Analyze about Memory Parallel Programming using Open MP and MPI.
CO5	Identify the point-to-point communication

COURSE CODE: 16CS8310 COURSE NAME: MANAGEMENT INFORMATION SYSTEMS	
CO1	Understand the basics of Management Information systems.
CO2	Formulate solutions social and ethical issues related to information technology infrastructure
CO3	Apply the knowledge on database management systems to store hybrid information in a business organization.
CO4	Recognize the use of security mechanisms to share business information over various types of networks
CO5	Explore the new IT initiatives for enhancing knowledge management information systems

COURSE CODE: 16CS8311 COURSE NAME: ENGINEERING ECONOMICS	
CO1	Understand the micro economic environment for creating a favorable business environment.
CO2	Take decision by making use of the major concepts and techniques of engineering economic analysis.
CO3	Compare the cost of multiple projects by using the methods learned, and make a quantitative decision between alternate facilities and/or systems..
CO4	Apply the appropriate engineering economics analysis method(s) for problem solving: present worth, annual cost, rate-of-return, payback, break-even, benefit-cost ratio.
CO5	Examine and evaluate the issues in macro-economic analysis.

COURSE CODE: 16CS8312 COURSE NAME: BIG DATA ANALYTICS	
CO1	Understand the basics of data analytics and big data technology
CO2	Understand the business intelligence and its framework.
CO3	Understand the implementation of big data analysis using Hadoop
CO4	Understand the HDFS concepts

CO5	Understand the implementation of Big data and its techniques in a variety of applications.

COURSE CODE: 16CS7403 **COURSE NAME: BIG DATA ANALYTICS**	
CO1	Understand the basics of C programming language
CO2	Apply the concepts of structures and unions
CO3	Apply the sorting, searching, hashing algorithms.
CO4	Understand the various testing and maintenance.
CO5	Understand the Project Management principles while developing software.

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COURSE OUTCOMES (COs)

SEMESTER VIII

COURSE CODE: 16CS8301 **COURSE NAME: SOFTWARE PROJECT MANAGEMNT**	
CO1	Describe project evaluation and planning.
CO2	Explain project life cycle and effort estimation.
CO3	Discuss activity planning and risk management.
CO4	Analyze project management and control.
CO5	Able to practice Project Management principles while developing a software.

COURSE CODE: 16CS8308 **COURSE NAME: SOFTWARE TESTING**	
CO1	Understand the fundamental concepts in software testing, including definition, principles, roles and defects.
CO2	Understand the strategies for software testing and understand black box and white box testing methods.
CO3	Apply various levels of software testing for software project.
CO4	Understand the issues in testing management and understand test planning.
CO5	Apply the test measurements and Reviews for software testing.

COURSE CODE: 16CS8312 **COURSE NAME: BIG DATA ANALYTICS**	
CO1	Understand the basics of data analytics and big data technology
CO2	Understand the business intelligence and its framework
CO3	Understand the implementation of big data analysis using Hadoop

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CO4	Understand the HDFS concepts
CO5	Understand the implementation of Big data and its techniques in a variety of applications.

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	ELECTRICAL AND ELECTRONICS ENGINEERING
PROGRAMME NAME	B.E
REGULATIONS	R2019

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO1	Graduate will be able to execute the principles of basic science, mathematics and engineering fundamentals necessary to formulate, solve and analyze engineering problems
PEO2	Graduate will be able to accrete the knowledge for pursuing advanced degrees in Engineering, Science, Management, Research and Development
PEO3	Graduate will be able to effectuate professionalism, leadership qualities, self and continuous learning and concern for environment to meet the societal needs.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

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 conclusion.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including predict ion and modeling 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

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	cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**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.
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.

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HICET

COURSE OUTCOMES (COs)

PROGRAM NAME: ELECTRICAL AND ELECTRONICS ENGINEERING
Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSE CODE : 21HE1101 COURSE NAME : TECHNICAL ENGLISH	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	Acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE: 21MA1103 COURSE NAME: CALCULUS AND DIFFERENTIAL EQUATIONS	
CO1	Apply the concept of differentiation in any curve.
CO2	Identify the maximum and minimum values of surfaces.
CO3	Apply double integrals to compute the area of plane curves.
CO4	Evaluation of triple integrals to compute volume of solids.
CO5	Develop sound knowledge of techniques in solving ordinary differential equations that model engineering problems.

COURSE CODE : 21PH115 COURSE NAME : APPLIED PHYSICS	
CO1	Illustrate the fundamental properties of matter
CO2	Discuss the Oscillatory motions of particles
CO3	Analyze the wavelength of different colors
CO4	Understand the advanced technology of LASER in the field of Engineering
CO5	Develop the technology of fiber optical communication in engineering field

COURSE CODE: 21CY1151 COURSE NAME: CHEMISTRY FOR ENGINEERS	
CO1	Differentiate hard and soft water and to solve the related problems on water purification and its significance in industries and daily life
CO2	Acquire the basic knowledge of polymers, composites and FRP and their significance.

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CO3	Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences to minimize corrosion to improve industrial design
CO4	Develop knowledge about the renewable energy resources and batteries along with the need of new materials to improve energy storage capabilities
CO5	Identify the structure and characteristics of unknown/new compound with the help of spectroscopy

COURSE CODE : 21CS1151 COURSE NAME : PYTHON PROGRAMMING AND PRACTICES	
CO1	Develop algorithmic solutions to simple computational problems
CO2	Read, write, execute by hand simple Python programs
CO3	Structure simple Python programs for solving problems and Decompose a Python program into functions
CO4	Represent compound data using Python lists, tuples, dictionaries
CO5	Read and write data from/to files in Python Programs.

COURSE CODE:21ME1152 COURSE NAME: ENGINEERING DRAWING	
CO1	Understand and interpret the engineering drawings in order to visualize the objects and draw the conics and special curves.
CO2	Draw the orthogonal projections of straight lines and planes.
CO3	Interpret the projections of simple solid objects in plan and elevation.
CO4	Draw the projections of section of solids and development of surfaces of solids.
CO5	Draw the isometric projections and the perspective views of different objects.

COURSE CODE: 21HE1071 COURSE NAME: LANGUAGE COMPETENCY ENHANCEMENT	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills

COURSE CODE: 21HE1072 COURSE NAME: CAREER GUIDANCE LEVEL I	
CO1	Enable students to approach learning Aptitude with ease, and understand recruiter expectation

COURSE CODE: 21HE1073 COURSE NAME: ENTREPRENEURSHIP & INNOVATION	
CO1	Understand the nature of business opportunities, resources, and industries in critical and creative aspects.



CO2	Understand the processes by which innovation is fostered, managed, and commercialized.
CO3	Remember effectively and efficiently the potential of new business opportunities.
CO4	Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness..
CO5	Develop a business model for a new venture, including revenue. Margins, operations, working capital, and investment.

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COURSE OUTCOMES (COs)

SEMESTER II

COURSE CODE : 21HE2101 COURSE NAME : BUSINESS ENGLISH FOR ENGINEERS	
CO1	Introduced to different modes and types of business communication.
CO2	Practiced to face and react to various professional situations efficiently.
CO3	Learnt to practice managerial skills.
CO4	Familiarized with proper guidance to business writing.
CO5	Trained to analyze and respond to different types of communication

COURSE CODE: 21MA2102 COURSE NAME: COMPLEX VARIABLES AND TRANSFORM CALCULUS	
CO1	Calculate Eigen values and Eigen vectors for a matrix, which are used to determine the natural frequencies.
CO2	Solve Partial Differential Equations using various methods.
CO3	Infer the knowledge of construction of analytic functions and conformal mapping.
CO4	Evaluate real and complex integrals over suitable closed paths or contours.
CO5	Apply Laplace transform and its properties to solve certain linear differential equations.

COURSE CODE : 21PH2151 COURSE NAME : MATERIAL SCIENCE	
CO1	Understand the purpose of acceptor or donor levels and the band gap of a semiconductor
CO2	Interpret the basic idea behind the process of magnetism and its applications in everyday
CO3	Discuss the behavior of super conducting materials
CO4	Illustrate the types and importance of crystal systems

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CO5	Evaluate the production of ultrasonics and its applications in NDT

COURSE CODE : 21CY2151 **COURSE NAME : ENVIRONMENTAL STUDIES**	
CO1	Develop an understanding of different natural resources including renewable resources
CO2	Realise the importance of ecosystem and biodiversity for maintaining ecological balance.
CO3	Understand the causes of environmental pollution and hazards due to manmade activities.
CO4	Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues.
CO5	Gain knowledge about the importance of women and child education and know about the existing technology to protect environment

COURSE CODE : 21CS2152 **COURSE NAME : ESSENTIAL OF IN C AND C++ PROGRAMMING**	
CO1	Develop simple applications in C using basic constructs.
CO2	Apply solutions to real world problems using basic characteristics of C++.
CO3	Write object-oriented programs using operator overloading, constructors and destructors.
CO4	Develop programs with the concepts of inheritance and polymorphism.
CO5	Understand and define solutions with C++ advanced features such as templates and exception handling

COURSE CODE : 21EE2151 **COURSE NAME : CIRCUIT THEORY**	
CO1	Apply basic laws to electrical circuits.
CO2	Solve electrical circuits using network theorems.
CO3	Explain the concept of resonance and solve coupled circuit problems.
CO4	Carryout problems in DC and AC transients.
CO5	Evaluate the three phase power measurement in balanced circuits

COURSE CODE : 21ME2001 **COURSE NAME : ENGINEERING PRACTICES LABORATORY**	
CO1	Fabricate wooden components and pipe connections including plumbing works.
CO2	Fabricate simple weld joints.
CO3	Fabricate different electrical wiring circuits and understand the AC Circuits

COURSE CODE : 21HE2071 **COURSE NAME : VALUE ADDED COURSE – II**	
CO1	Introduced to different modes and types of communication.

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CO2	Practiced to face and react to various professional situations efficiently.
CO3	Learnt to practice managerial skills.
CO4	Familiarized with proper guidance to writing.
CO5	Trained to analyze and respond to different types of communication.

COURSE CODE : 21HE2072 COURSE NAME : CAREER GUIDANCE LEVEL II	
CO1	Enable students to solve questions on Verbal, Logical and Quantitative Aptitude of placement level.

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SEMESTER III

COURSE CODE : 21MA3102 COURSE NAME : FOURIER ANALYSIS AND TRANSFORMS	
CO1	Understand the principles of Fourier series which helps them to solve physical problems of engineering.
CO2	Employ Fourier series in solving the boundary value problems.
CO3	Understand Fourier series in solving the two dimensional heat equations.
CO4	Apply Fourier transform techniques which extend its applications.
CO5	Illustrate the Z- transforms for analyzing discrete-time signals and systems.

COURSE CODE : 21EE3201 COURSE NAME : ELECTRONIC DEVICES AND CIRCUITS	
CO1	Apply the knowledge acquired about electronic devices.
CO2	Summarize the concepts of transistors.
CO3	Transform the acquired skill in designing a circuit.
CO4	Illustrate the nature of large signal amplifiers.
CO5	Outline the concepts of feedback amplifiers, conditions for oscillation and types

COURSE CODE : 21EE3202 COURSE NAME : ELECTRICAL MACHINES I	
CO1	Describe the coupled coil calculate the self and mutually induced emf.
CO2	Analyze the operation of transformer in different loading condition.
CO3	Explain the concept of field energy and co-energy in single and multiple excited systems
CO4	Demonstrate the construction of D.C machines and operation of DC Generator

CO5	Derive the performance equation of D.C motor under various load condition

COURSE CODE : 21EE3203 **COURSE NAME : FIELD THEORY**	
CO1	Apply the Vector calculus application in Electromagnetics.
CO2	Analyze the concepts of Electromagnetics
CO3	Evaluate the concepts of Magnetostatics
CO4	Analyze the propagation of plane Electromagnetic wave.
CO5	Compare the concepts of Plane wave reflection,refraction and penetration

COURSE CODE: 21EE3251 **COURSE NAME: ELECTRICAL AND ELECTRONIC MEASUREMENTS**	
CO1	Definition of errors, error analysis and characteristics response of different order transducers.
CO2	In-depth knowledge about resistive transducers.
CO3	Outline an adequate knowledge about various inductive transducers.
CO4	Make use of capacitive transducers on industrial parameters measurement.
CO5	Summarize the role of different industrial transducers and sensors

COURSE CODE : 21EE3001 **COURSE NAME : ELECTRONIC DEVICES AND CIRCUITS LABORATORY**	
CO1	Understand the characteristics of semiconductor devices
CO2	Develop various electronic circuit configurations.
CO3	Demonstrate the frequency response of amplifiers.
CO4	Examine the current series feedback amplifier and RC phase shift oscillator.
CO5	Construct and testing the of rectifier circuits.

COURSE CODE : 21EE3002 **COURSE NAME : ELECTRICAL MACHINES LABORATORY I**	
CO1	Ability to operate the DC generators and motors.
CO2	Ability to choose the type of DC machine for specific applications.
CO3	Determine the performance characteristics of DC motor by conducting direct and indirect tests.
CO4	Ability to model the transformer and their application to power system.
CO5	Determine the performance characteristics of DC shunt and Compound generator by conducting load tests.

COURSE CODE : 21MC3191 **COURSE NAME : INDIAN CONSTITUTION**	
CO1	Understand the functions of the Indian government
CO2	Understand and abide the rules of the Indian constitution.

COURSE CODE : 19HE3072 COURSE NAME : CAREER GUIDANCE LEVEL III	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

COURSE CODE : 21HE3073 COURSE NAME : LEADERSHIP MANAGEMENT SKILLS	
CO1	To practice essential leadership skills in day to day operations
CO2	To work on leadership skills in the study environment
CO3	To understand and develop the skills consciously.
CO4	To know about the real worth of all the skills for success
CO5	To Analyze the real worth of the person and suggestion for improvement

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COURSE OUTCOMES (COs)

SEMESTER IV

COURSE CODE : 21MA4101 COURSE NAME : NUMERICAL METHODS	
CO1	Solve the system of linear algebraic equations which extends its applications in the field of engineering.
CO2	Apply various methods to find the intermediate values for the given data.
CO3	Identify various methods to perfrom numerical differentiation and l integration
CO4	Classify and solve ordinary differential equations by using single and multi step methods.
CO5	Illustrate various methods to find the solution of ordinary and partial differential equations.

COURSE CODE: 21EE4201 COURSE NAME: ELECTRICAL MACHINES II	
CO1	Analyze and draw the performance characteristics of the three phase induction motor.
CO2	Demonstrate the starters for starting and control the speed of three phase induction motors
CO3	State the fundamentals and evaluate the performance of single phase induction motors
CO4	Apply different methods to obtain the regulation of synchronous generator under various load condition.

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CO5	Draw the performance characteristics of synchronous motor under different excitation conditions

COURSE CODE : 21EE4202 **COURSE NAME : INTEGRATED CIRCUITS AND ITS**	
CO1	Interpret the IC fabrication procedure.
CO2	Analyze the characteristics of operational amplifiers.
CO3	Outline the applications of OP-AMP.
CO4	Understand the working principle of special IC's.
CO5	Outline the function of voltage regulator as special IC's.

COURSE CODE : 21EE4203 **COURSE NAME : DIGITAL SIGNAL PROCESSING**	
CO1	Classify the different types of signals and systems and Analyze a Discrete Time linear invariant Systems.
CO2	Apply z-transform and inverse Z transform and analyze discrete time systems.
CO3	Apply Radix-2 Decimation in Time (DIT) and Decimation in Frequency (DIF) FFT Algorithm to Compute Discrete Fourier Transform
CO4	Realize structure and design Infinite Impulse Response (IIR) filters and Finite Impulse Response (FIR) filters.
CO5	Discuss the various architectures of Digital signal processors

COURSE CODE : 21EE4251 **COURSE NAME : DIGITAL LOGIC CIRCUITS**	
CO1	Apply the knowledge acquired about Boolean functions.
CO2	Summarize the concepts of combinational circuits.
CO3	Transform the acquired skill in designing the synchronous sequential circuits.
CO4	Ability to understand and analyze the asynchronous sequential circuits.
CO5	Outline the concepts of HDL.

COURSE CODE : 21EE4001 **COURSE NAME : ELECTRICAL MACHINES LABORATORY II**	
CO1	Perform load test on Induction motors and comment their performance characteristics.
CO2	Predetermine the regulation of three phase alternator by EMF, MMF, and ZPF and Slip test.
CO3	Draw the performance characteristics of three phase synchronous motor.
CO4	Execute no load and blocked rotor test on induction motors to determine the internal parameters of three phase induction motor through an equivalent circuit.
CO5	Analyze and calculate the losses of three phase induction motor.



COURSE CODE : 21EE4002 COURSE NAME : INTEGRATED CIRCUITS LABORATORY	
CO1	Understand the performance characteristics of Op-amp.
CO2	Implementation of various applications of Op-amp.
CO3	Understand the performance of filters and converters.
CO4	Construct multivibrator and regulated power supply circuits using IC
CO5	Assimilate the knowledge on VCO and PLL ICS.

COURSE CODE : 21MC4191 COURSE NAME : ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE/ VALUE EDUCATION	
CO1	Ability to understand the structure of Indian system of life.
CO2	Connect up and explain basics of Indian Traditional knowledge in modern scientific perspective.

COURSE CODE : 19HE4072 COURSE NAME : CAREER GUIDANCE – LEVEL IV	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

COURSE CODE : 19HE4073 COURSE NAME : IDEATION SKILLS	
CO1	Develop a strong understanding and importance of ideation
CO2	Learn about the different kinds of tools for Ideation.
CO3	Learn the need and significance of prototyping and its significance

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SEMESTER V

COURSE CODE : 21EE5201 COURSE NAME : DESIGN OF ELECTRICAL MACHINES	
CO1	Apply the knowledge acquired from Specific loading and rating of electrical machines.
CO2	Understand the design concepts and apply to design the Main dimensions of DC Machine.
CO3	Provide the solutions for Transformer cooling.
CO4	Understand the design concepts and apply to design the Main dimensions of Induction Machine.
CO5	Analyze and design the Main dimensions of Synchronous machines.

COURSE CODE: 21EE5202

COURSE NAME: RENEWABLE AND NON-RENEWABLE	
CO1	Understand the concepts and operation of solar photovoltaic power generation
CO2	Articulate the construction and working of the components used in wind power generation
CO3	Comprehend the concept of power generation using fuel cell, geothermal and ocean energy sources.
CO4	Demonstrate the concepts of the components used in coal based thermal power plants.
CO5	Exhibit the concepts of the components used in Hydro and Nuclear power plants

COURSE CODE : 21EE5203 COURSE NAME : MICROPROCESSORS AND MICROCONTROLLERS	
CO1	Study the architecture of 8085 microprocessor and programming concept involved in 8085.
CO2	Understand the commonly used peripheral/ interfacing IC's with its programming.
CO3	Understand the architecture and programming concepts of 8051 microcontroller.
CO4	Learn the advanced controller fundamentals and programming.
CO5	Understand the applications and role of advanced microcontrollers.

COURSE CODE : 21EE5204 COURSE NAME : TRANSMISSION AND DISTRIBUTION	
CO1	Differentiate the types of transmission and distribution systems and illustrate the structure of power system.
CO2	Develop the expressions for calculation of transmission line parameters and their effects.
CO3	Evaluate the performance of transmission line using T and method.
CO4	Analyze the voltage distribution in insulator strings and cables; identify methods to improve the voltage distribution.
CO5	Analyze and design tower distance in transmission line by computing sag and tension of line conductor.

COURSE CODE : 21EE5251 COURSE NAME : CONTROL SYSTEMS ENGINEERING	
CO1	Apply the gained knowledge for modeling of mechanical, electrical control systems
CO2	Deduct the different order systems with various inputs and their response
CO3	Estimate the various frequency domain specifications by phase analysis
CO4	Investigate the control systems stability and compensator design
CO5	Develop a state models and discrete control systems for any application

COURSE CODE : 21EE5001 COURSE NAME : CONTROL AND INSTRUMENTATION LABORATORY	
CO1	Estimate the effect of P, PI, PID controllers for the given system specifications.
CO2	Design and implement the compensation techniques.
CO3	Derive the transfer functions of D.C machines.
CO4	Construct the AC and DC bridges.
CO5	Analyze the performance characteristics of various transducers

COURSE CODE : 21EE5002 COURSE NAME : MICROPROCESSORS AND MICROCONTROLLERS LABORATORY	
CO1	Understand the 8085architecture and its programming execution.
CO2	Learn interfacing knowledge with different applications.
CO3	Study the simple and interfacing programming concepts of 8051.
CO4	Understand the Interfacing and basic programming concept of Arduino.
CO5	Understand the industrial application of microcontroller by various programming concepts.

COURSE CODE : 21HE5071 COURSE NAME: SOFT SKILLS - I	
CO1	Students will have clarity on their career exploration process and to match their skills and interests with a chosen career path.
CO2	Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others
CO3	Students will understand how teamwork can support leadership skills
CO4	Students will be able to make sense of problems, develop strategies to find solutions, and persevere in solving them.
CO5	Students will demonstrate an enhanced ability to draw logical conclusions and implications to solve logical problems.

COURSE CODE : 21HE5072 COURSE NAME : DESIGN THINKING	
CO1	Develop a strong understanding of the Design Process
CO2	Learn to develop and test innovative ideas through a rapid iteration cycle.
CO3	Develop teamwork and leadership skills

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COURSE OUTCOMES (COs)

COURSE CODE : 21EE6181 COURSE NAME : INDUSTRIAL SAFETY MANAGEMENT	
CO1	Explain the concepts of Engineering Safety and its acts.
CO2	Understand and analyze on Safety Management levels.
CO3	Appraise the investigation strategies for an industry.
CO4	Summarize the various Safety performance monitoring and apply them.
CO5	Elaborate the safety education and its various training methods.

COURSE CODE: 21EE6201 COURSE NAME: POWER ELECTRONICS	
CO1	Articulate the Power semiconductor switches in various circuits.
CO2	Understand the various converters.
CO3	Plan and operate the DC-DC Converters on real time applications.
CO4	Understand the inverters and Pulse width Modulated Inverter.
CO5	Understand AC to AC converters and apply the UPS for specific applications

COURSE CODE : 21EE6202 COURSE NAME : POWER SYSTEM ANALYSIS	
CO1	Develop knowledge on mathematical model of power system components.
CO2	Interpret the mechanisms to address load flow problems in power system.
CO3	Create computational models for analysis symmetrical conditions in power systems.
CO4	Develop sequential models for the unsymmetrical fault conditions in power systems
CO5	Analyze the stability of the Power System.

COURSE CODE : 21EE6251 COURSE NAME : EMBEDDED SYSTEMS	
CO1	Understand The Basic Structure of Embedded Processors
CO2	Acquire the knowledge in the architecture of Embedded System
CO3	Articulate the knowledge in operating systems for embedded process
CO4	Outline RTOS concepts and issues in embedded system design process.
CO5	Demonstrate the design and implementation process of real time products

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COURSE CODE : 21EE6001 COURSE NAME : POWER ELECTRONICS LABORATORY	
CO1	Understand the applications of Power electronic devices and circuits.
CO2	Operate the AC/DC in real time applications.
CO3	Understand the working of AC/AC Converters.
CO4	Plan and Operate the control of DC/DC converters.
CO5	Develop and Simulate various Power Electronics circuits using MATLAB.

COURSE CODE : 21EE6002 COURSE NAME : CONTROL WIRING AND CIRCUIT DESIGN LABORATORY	
CO1	Construct and test the different control circuits of induction motor.
CO2	Provide control circuit for single phasing and reversal of motor.
CO3	Experimentally verify the control circuit for starters.
CO4	Develop the voltage control circuits using electronic components.
CO5	Understand the various components and working of an inverter.

COURSE CODE : 21EE6701 COURSE NAME : INTERNSHIP/INDUSTRIAL TRAINING	
CO1	Improve the skills to communicate efficiently and gain management skills related to industry / research organizations.
CO2	Extend the boundaries of knowledge through research and development.
CO3	Discriminate the knowledge and skills acquired at the workplace to their on-campus studies.
CO4	Develop greater clarity about academic and career goals.
CO5	Visualize the impact of engineering solutions to the society.

COURSE CODE : 21HE6071 COURSE NAME : SOFT SKILLS-II	
CO1	Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict.
CO2	Students will Actively participate meetings, Group Discussions / interviews and prepare & deliver presentations
CO3	Students will define professional behavior and suggest standards for appearance, actions and attitude in a Business environment.
CO4	Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.
CO5	Students will excel in complex reasoning.

COURSE CODE : 21HE6072 COURSE NAME : INTELLECTUAL PROPERTY RIGHTS (IPR)	
CO1	Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.

CO2	Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.
CO3	Identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing.
CO4	Identify different types of trademarks and procedure for registration
CO5	Recognize the concept of design, geographical indication and procedure for registration

PROFESSIONAL ELECTIVE-I

COURSE CODE : 19EE5301 COURSE NAME : FIBER OPTICS AND LASER INSTRUMENTS	
CO1	Enumerate the properties of optical fibers.
CO2	Apply the optical fibers for industrial applications.
CO3	Apply the optical fibers for industrial applications.
CO4	Choose the lasers for industrial applications
CO5	Illustrate holography and medical applications of lasers.

COURSE CODE : 19EE5302 COURSE NAME : BIOMEDICAL INSTRUMENTATION	
CO1	Ability to understand the basics of biomedical Engineering
CO2	Explain various technique for non-electrical physiogical measurements
CO3	Illustrate different electrode placement for various physiological recordings
CO4	Differentiate the different imaging techniques.
CO5	Demonstrate different techniques for life assisting and therapeutic devices

COURSE CODE : 19IT5331 COURSE NAME : FUNDAMENTALS OF JAVA PROGRAMMING	
CO1	Understand basic Java programs with concepts
CO2	Develop Java programs using OOP principles and inheritance
CO3	Develop Java programs with the concepts interfaces
CO4	Build Java applications using exceptions and I/O streams
CO5	Develop Java applications with threads and generics classes

COURSE CODE : 19EE5304 COURSE NAME : COMPUTER NETWORKS	
CO1	Identify the components required to build different types of networks and aware of media access control
CO2	Understand the data communication system and the purpose of layered architecture
CO3	Analyze the concepts of Routing methods and Subnetting.
CO4	Design protocols for various functions in the network

CO5	Understand the working of protocols for various Applications.

COURSE CODE ;19EE5305 COURSE NAME : CONTROL OF ELECTRICAL APPARATUS	
CO1	Apply basic knowledge for electrical control apparatus.
CO2	Obtain the knowledge on control of circuit Components.
CO3	Demonstrate the Control circuit of three phase induction motor starters.
CO4	Illustrate the power control circuits for real-time applications.
CO5	Exhibit basic concepts of advanced industrial controllers.

PROFESSIONAL ELECTIVE – II

COURSE CODE: 19EE6301 COURSE NAME : INDUSTRIAL AUTOMATION	
CO1	Understand the parts and operation of Programmable Logic Controller.
CO2	Understand the PLC programming and ladder diagram.
CO3	Understand the PLC instructions and apply in various case studies.
CO4	Remember the architecture and interfaces of SCADA System.
CO5	Remember various protocols and applications of SCADA.

COURSE CODE: 19EE6302 COURSE NAME : ELECTRIC VEHICLE MECHANICS AND CONTROL	
CO1	Understand the architecture and dynamics of EVs and HEVs
CO2	Design an EV for standard drive cycle
CO3	Understand the electrical motors' characteristics and its application for vehicle dynamics
CO4	Workout the energy requirements and energy sources for EV application
CO5	Understand the mode of operation and control architecture

COURSE CODE: 19EE6303 COURSE NAME :FLEXIBLE AC TRANSMISSION SYSTEMS	
CO1	Study and describe the reactive power control techniques.
CO2	Understand the modelling of static VAR compensators and its applications.
CO3	Learn the modelling of TCSC and their applications.
CO4	Acquire knowledge on VSC FACTS Controllers and Thyristor controlled series capacitors.
CO5	Understand the various FACTS controller and apply the relevant algorithms in appropriate applications.

COURSE CODE: 19EE6304 COURSE NAME: ELECTRICAL ESTIMATION AND COSTING	
CO1	Identify various elements of estimation and wiring types
CO2	Design circuits for lighting, fan and alarm
CO3	Estimate electrical installation for residential buildings

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CO4	Design control circuit for power and motor control
CO5	Estimate various connections for power and apply Indian electricity rules

COURSE CODE: 19EE6305 **COURSE NAME: PRINCIPLES OF ROBOTICS**	
CO1	Understand the basics of robotics.
CO2	Develop different model for a given Robotic manipulator.
CO3	Describe the trajectory planning for robotics.
CO4	Generalize role of sensors and machine vision in Robotics.
CO5	Study on robot programming and languages.

OPEN ELECTIVE

COURSE CODE: 19EE6401 **COURSE NAME: FUNDAMENTALS OF SOLAR PHOTOVOLTAIC SYSTEMS**	
CO1	Ability to identify the energy demand and environmental impacts.
CO2	Ability to explain the different solar measurement techniques.
CO3	Ability to develop the solar modules.
CO4	Ability to understand different supporting components of Solar PV systems.
CO5	Ability to explain the applications of Solar PV systems

HICET

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	ELECTRICAL AND ELECTRONICS ENGINEERING
PROGRAMME NAME	B.E
REGULATIONS	R2016

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO1	Graduate will be able to execute the principles of basic science, mathematics and engineering fundamentals necessary to formulate, solve and analyze engineering problems
PEO2	Graduate will be able to accrete the knowledge for pursuing advanced degrees in Engineering, Science, Management, Research and Development
PEO3	Graduate will be able to effectuate professionalism, leadership qualities, self and continuous learning and concern for environment to meet the societal needs.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

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 conclusion.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including predict ion and modeling 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	**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.
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.

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COURSE OUTCOMES (COs)

SEMESTER VII

COURSE CODE: 16EE7201 COURSE NAME: SOLID STATE DRIVES	
CO1	Analyze the stability of the system depending on load.
CO2	Identify the type of electric motor applicable for various applications.
CO3	Analyze the operation of the converter and chopper fed dc drive.
CO4	Design the speed controllers for a closed loop solid state DC motor drives.
CO5	Design the speed controllers for induction motors to control and maintain the speed.

COURSE CODE: 16EE7202 COURSE NAME: ELECTRICAL ENERGY UTILIZATION AND CONSERVATION	
CO1	Analyze the various power generation methods both conventional and non-conventional.
CO2	Valuate the most appropriate heating or welding techniques for suitable applications.
CO3	Assess the various level of illuminosity produced by different illuminating sources.
CO4	Formulate the different types of traction motors and braking .
CO5	Handle the engineering aspects of electrical energy generation and utilization

COURSE CODE: 16EE7203 COURSE NAME: POWER SYSTEM OPERATION AND CONTROL	
CO1	Interpret the overview of power system operations.
CO2	Analysis the single area and multi-area system using frequency control
CO3	Summarize the various voltage control methods of power system
CO4	Solve the economic load dispatch, optimum unit commitment for a power system
CO5	Illustrate the functional content of SCADA, EMS and related systems

COURSE CODE: 16EE7001 COURSE NAME: DRIVES AND CONTROL LABORATORY	
CO1	Develop a power electronic circuit using simulation softwares.
CO2	Simulates a closed loop control of conveter fed electrical drives.

CO3	Identify a suitable power electronic converter for ax and dc motor
CO4	Evaluate the speed controlling techniques for BLDC motor using DSP.
CO5	Examine the configuration of PLC drives for ac motor

COURSE CODE: 16EE7701 **COURSE NAME: PRESENTATION SKILLS AND TECHNICAL SEMINAR**	
CO1	Prepare and present a topic on engineering subjects.
CO2	Prepare and present general topics effectively with good communication skills
CO3	Categorize the available teaching aids and use them in their presentations.
CO4	Discuss their ideas with confidence
CO5	Transfer their technical or general knowledge to others with confidence.

COURSE CODE: 16EE7702 **COURSE NAME: INDUSTRIAL TRAINING / INTERNSHIP**	
CO1	Improve the skills to communicate efficiently and gain management skills related to industry / research organizations.
CO2	Extend the boundaries of knowledge through research and development.
CO3	Discriminate the knowledge and skills acquired at the workplace to their on-campus
CO4	Develop greater clarity about academic and career goals.
CO5	Visualize the impact of engineering solutions to the society.

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COURSE OUTCOMES (COs)

SEMESTER VIII

COURSE CODE: 16EE8901 **COURSE NAME: PROJECT WORK**	
CO1	Implement the skills acquired in the previous semesters to solve complex engineering problems.
CO2	Develop a model / prototype of an idea related to the field of specialization.
CO3	Establish the work individually or in a team to identify, troubleshoot and build products for environmental and societal issues.
CO4	Effective presentation of ideas with clarity.
CO5	Evaluate surveys towards developing a product which helps in life time learning.

PROFESSIONAL ELECTIVE-III

COURSE CODE: 16EE7301 COURSE NAME :MICROCONTROLLER BASED SYSTEM DESIGN	
CO1	Experience of working at the architecture of the PIC microcontrollers
CO2	Identify factors moving the data transfer and interrupts and timer in PIC microcontroller
CO3	Programme the controller for typical industrial Electronics application
CO4	write ARM Assembly Language program
CO5	Embed the code in ARM processor for stand-alone system for embedded system designs.

COURSE CODE: 16EE7302 COURSE NAME : MICRO ELECTRO MECHANICAL SYSTEMS	
CO1	Study and identify the types of semiconductors used in MEMS
CO2	Analyze the Micro fabrication techniques
CO3	Generalize the different Types Of Sensors And Actuators.
CO4	Design the different Materials used for MEMS.
CO5	Develop different components related to MEMS and apply in various Engineering disciplines.

COURSE CODE: 16EE7303 COURSE NAME : SOLAR PHOTOVOLTAIC FUNDAMENTALS & APPLICATIONS	
CO1	Illustrate basics of solar photovoltaic systems, solar radiation and its measurements
CO2	Characterize various solar tracking systems.
CO3	Practice the types and arrangement of PV modules.
CO4	Evaluate various level of balance of solar PV systems.
CO5	Generalize various solar photovoltaic applications.

COURSE CODE: 16EE7304 COURSE NAME : PROFESSIONAL ETHICS	
CO1	Analyze various concepts and theories of engineering ethics.
CO2	Apply the concepts of ethics and analyze its impact on society.
CO3	Apply and analyze the concept of safety and risk in the light of engineering ethics
CO4	Analyze and evaluate the rights and responsibility of engineer
CO5	Analyze the ethical issues engineers have to consider while operating globally.

PROFESSIONAL ELECTIVE-III

COURSE CODE: 16EE7305 COURSE NAME : ADVANCED CONTROL THEORY

CO1	Design compensators
CO2	Analyze non-linear systems using describing function
CO3	Represent state space by different variables
CO4	Analyze stability of sampled data control system
CO5	Design and control system in state space.

COURSE CODE: 16EE7306 COURSE NAME : INTELLIGENT CONTROL TECHNIQUES	
CO1	Recognize the appropriate soft computing frame works
CO2	Identify and apply neural networks concepts in decision making applications
CO3	Explore the various membership functions of fuzzy logic.
CO4	Observe genetic algorithm and its applications
CO5	Apply hybrid soft computing techniques in suitable tasks.

COURSE CODE: 16EE7307 COURSE NAME : COMMUNICATION ENGINEERING	
CO1	Experience on analog communication. and demodulation
CO2	Analyze the performance of a sampling and pass band digital communication system in terms of error rate and calculation
CO3	Perform the network protocol and error control codes of the signals in a data communication system.
CO4	Know about the multiple access techniques, transmission medium and error control.
CO5	Gather expose on satellite and optical fibre communication.

COURSE CODE: 16EE7308 COURSE NAME : SPECIAL ELECTRICAL MACHINES	
CO1	Identify various special electrical motors for specific applications.
CO2	Control the speed of the Stepper motor using an appropriate controller.
CO3	Select an appropriate power converter of Switched Reluctance Motor drive for different applications.
CO4	Develop a speed controller for Brushless DC Motors using microprocessor.
CO5	Illustrate the working of Permanent Magnet Synchronous Motor by using sensorless control.

PROFESSIONAL ELECTIVE-V

COURSE CODE: 16EE8301 COURSE NAME : APPLICATION OF POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS	
CO1	Familiarized the basic of renewable energy systems..
CO2	Design the different power converters namely AC to DC, DC to DC and AC to AC converters for renewable energy systems

CO3	Analysis the operation of solar and wind systems at stand alone and Grid integrated system
CO4	Develop the hybrid renewable energy systems
CO5	Intend the algorithm of MPPT technique used in wind energy systems.

COURSE CODE: 16EE8302 COURSE NAME : BIOMEDICAL INSTRUMENTATION	
CO1	Explain the human physiological system and fundamentals of biomedical engineering
CO2	Examine the non-electrical parameters measurement systems.
CO3	Evaluate the electrical parameters measurement systems and electrical safety.
CO4	Analyze the various imaging techniques.
CO5	Enumerate the life assisting and therapeutic equipments.

COURSE CODE: 16EE8303 COURSE NAME : POWER SYSTEM DYNAMICS	
CO1	Identify the basics of power system dynamics
CO2	Analyze dynamic modeling of a synchronous machine.
CO3	Develop the models for excitation and speed governing system.
CO4	Explain the fundamental concepts of stability of dynamic systems.
CO5	Examine the small signal stability problem in power systems.

COURSE CODE: 16EE8304 COURSE NAME : ENERGY MANAGEMENT AND ELECTRICAL SAFETY	
CO1	Calculate different Electricity tariff , penalty concepts
CO2	Design energy efficient transformers
CO3	Identify the Energy saving opportunities in pumps
CO4	Design proper lighting scheme with Energy saving opportunities
CO5	Summarize the Electrical safety rules

PROFESSIONAL ELECTIVE-VI

COURSE CODE: 16EE8305 COURSE NAME : COMPUTER AIDED DESIGN OF ELECTRICAL APPARATUS	
CO1	Identify an appropriate design using finite element analysis for electromagnetic study.
CO2	Derive the power and energy equations and calculate the electrical losses
CO3	Develop the mathematical model of steady state analysis for AC machines
CO4	Explain the concepts of organization of CAD packages.
CO5	Select the appropriate design procedures of different Electrical apparatus.

COURSE CODE: 16EE8306 COURSE NAME : INDUSTRIAL ELECTRONICS	
CO1	Design the power supplies for electronic circuits
CO2	Design the firing circuits for converters
CO3	Choose the power converter for industrial application
CO4	Employ soft switching technique to control AC and DC motors
CO5	Troubleshoot the various domestic and industrial appliances

COURSE CODE: 16EE8307 COURSE NAME : HIGH VOLTAGE DIRECT CURRENT TRANSMISSION	
CO1	Explain Planning and Modern trends in HVDC technology.
CO2	Design HVDC converter system.
CO3	Summarize the converter control configurations used in HVDC transmission
CO4	Generalize filters for eliminating harmonics and design of AC filters
CO5	Criticize the power flow analysis and HVDC system simulation

COURSE CODE: 16EE8308 COURSE NAME : TOTAL QUALITY MANAGEMENT	
CO1	Gain basic knowledge in total quality management relevant to both manufacturing and service industry including IT sector.
CO2	Implement the basic principles of TQM in manufacturing and service based organization.
CO3	Apply the tools and techniques of quality management to manufacturing and services processes.
CO4	Apply the tools and techniques of quality management to manufacturing and services processes
CO5	Gain the knowledge on various ISO standards and quality systems

OPEN ELECTIVE

COURSE CODE: 16EE6401 COURSE NAME : TO INDUSTRIAL AUTOMATION – PLC AND SCADA TAL QUALITY MANAGEMENT	
CO1	Demonstrate the knowledge of Programmable Logic Controllers
CO2	Develop Programs using ladder diagram.
CO3	Correlate the applications of PLC in various domains.
CO4	Summarise the basic concepts involved in SCADA System.
CO5	Analyze about communication standards in SCADA.

COURSE CODE: 16EE7402 COURSE NAME : LABVIEW FOR ENGINEERING APPLICATIONS	
CO1	Interpret knowledge on virtual instrumentation using LabVIEW
CO2	Perform the basic programming with LabVIEW palettes.
CO3	Outline concept of various instrument interfaces with LabVIEW
CO4	Employ the role of DAQ concepts for interfacing hardware

	components
CO5	Employ the role of DAQ concepts for interfacing hardware components

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	ELECTRONICS AND COMMUNICATION ENGINEERING
PROGRAMME NAME	B.E ECE
REGULATIONS	R 2019

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1	To prepare the graduates to solve, analyze and develop real time engineering products by providing strong foundation in the fundamentals of Electronics and Communication Engineering.
PEO2	To prepare the graduates to succeed in multidisciplinary dimensions by providing adequate trainings and exposure to emerging technologies.
PEO3	To prepare the graduates to become a successful leader and innovator following ethics with the sense of social responsibility for providing engineering solutions.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

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 considerations for the public health and safety, and the cultural, societal and environmental consideration.
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.

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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 environment.
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.

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COURSE OUTCOMES (COs)

PROGRAM NAME – B.E ECE

Upon the successful completion of the course, the students will be

SEMESTER I

COURSE CODE : 21HE1101 COURSE NAME : TECHNICAL ENGLISH	
CO1	To gain knowledge about basic grammar and elements of professional communication.
CO2	To understand formal and technical communication.
CO3	To apply the basic elements of grammar and communication in professional situation.
CO4	To analyse and interpret different styles of correspondence.
CO5	To compose official letters and technical proposals and make presentations.

COURSE CODE : 21MA1103 COURSE NAME : CALCULUS AND DIFFERENTIAL EQUATIONS	
CO1	Apply the concept of differentiation in any curve.
CO2	Identify the maximum and minimum values of surfaces.
CO3	Apply double integrals to compute the area of plane curves.
CO4	Evaluation of triple integrals to compute volume of solids.
CO5	Develop sound knowledge of techniques in solving ordinary differential equations that model engineering problem

COURSE CODE :21PH1151 COURSE NAME : APPLIED PHYSICS	
CO1	Illustrate the fundamental properties of matter
CO2	Discuss the Oscillatory motions of particles
CO3	Analyze the wavelength of different colors
CO4	Understand the advanced technology of LASER in the field of Engineering
CO5	Develop the technology of fiber optical communication in engineering field

COURSE CODE :21CY1151 COURSE NAME : CHEMISTRY FOR ENGINEERS	
CO1	Differentiate hard and soft water and to solve the related problems on water purification and its significance in industries and daily life

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CO2	Acquire the basic knowledge of polymers, composites and FRP and their significance.
CO3	Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences to minimize corrosion to improve industrial design.
CO4	Develop knowledge about the renewable energy resources and batteries along with the need of new materials to improve energy storage capabilities.
CO5	Identify the structure and characteristics of unknown/new compound with the help of spectroscopy.

COURSE CODE : 21CS1151 COURSE NAME : PYTHON PROGRAMMING AND PRACTICES	
CO1	Develop algorithmic solutions to simple computational problems
CO2	Read, write, execute by hand simple Python programs
CO3	Structure simple Python programs for solving problems and Decompose a Python program into functions
CO4	Represent compound data using Python lists, tuples, dictionaries
CO5	Read and write data from/to files in Python Programs

COURSE CODE : 21EC1153 COURSE NAME : ELECTRON DEVICES AND ELECTRIC CIRCUITS	
CO1	Ability to explain the theory, construction, and operation of PN junction and Zenerdiodes
CO2	Ability to explain the theory, construction, and operation of BJT & FET.
CO3	Understand the working of various power devices and display devices.
CO4	To apply network theorems for AC and DC Circuits
CO5	Understand the concept of transient response of circuits

COURSE CODE : 21HE1071 COURSE NAME : LANGUAGE COMPETENCY ENHANCEMENT COURSE-I	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE : 21HE1072 COURSE NAME : CAREER GUIDANCE – LEVEL I	
CO1	Enable students to approach learning Aptitude with ease, and understand recruiter expectation.

COURSE CODE : 21HE1073 COURSE NAME : ENTREPRENEURSHIP & INNOVATION	
CO1	Understand the nature of business opportunities, resources, and industries in critical and creative aspects.
CO2	Understand the processes by which innovation is fostered, managed, and commercialized.
CO3	Remember effectively and efficiently the potential of new business opportunities.
CO4	Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness..
CO5	Develop a business model for a new venture, including revenue. Margins, operations, working capital, and investment.

COURSE CODE : 21HE2101 COURSE NAME : BUSINESS ENGLISH FOR ENGINEERS	
CO1	To know different modes of business communication
CO2	To understand managerial techniques
CO3	To apply the rules of grammar and vocabulary in effective business communication.
CO4	To analyse and interpret business documents.
CO5	To draft business reports

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	COURSE OUTCOMES (COs)

SEMESTER II

COURSE CODE : 21MA2103 COURSE NAME : LINEAR ALGEBRA, NUMERICAL METHODS AND TRANSFORM CALCULUS	
CO1	Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural
CO2	Apply various methods to find the intermediate values for the given data.
CO3	Identify various methods to perfrom numerical differentiation and l integration
CO4	Classify and solve ordinary differential equations by using single and multi step methods.
CO5	Infer the knowledge of Laplace and Inverse laplace transform

COURSE CODE : 21PH2151 COURSE NAME : MATERIAL SCIENCE

CO1	Understand the purpose of acceptor or donor levels and the band gap of a semiconductor
CO2	Interpret the basic idea behind the process of magnetism and its applications in everyday
CO3	Discuss the behavior of super conducting materials CO4: Illustrate the types and importance of crystal systems
CO4	Illustrate the types and importance of crystal systems

COURSE CODE :21CY2151 COURSE NAME : ENVIRONMENTAL STUDIES	
CO1	Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
CO2	Understand the causes of environmental pollution and hazards due to manmade activities.
CO3	Develop an understanding of different natural resources including renewable resources
CO4	Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues.
CO5	Gain knowledge about the importance of women and child education and know about the existing technology to protect environment

COURSE CODE : 21CS2152 COURSE NAME : ESSENTIALS OF C AND C++	
CO1	Able to develop simple applications in C using basic constructs.
CO2	Able to apply solutions to real world problems using basic characteristics of C++.
CO3	Able to write object-oriented programs using operator overloading, constructors and destructors.
CO4	Able to develop programs with the concepts of inheritance and polymorphism.
CO5	Able to understand and define solutions with C++ advanced features such as templates and exception handling

COURSE CODE : 21ME2154 COURSE NAME : ENGINEERING GRAPHICS	
CO1	Understand and interpret the engineering drawings in order to visualize the objects and draw the conics and special curves.
CO2	Draw the orthogonal projections of straight lines and planes.
CO3	Interpret the projections of simple solid objects in plan and elevation.
CO4	Draw the projections of section of solids and development of surfaces of solids.
CO5	Draw the isometric projections and the perspective views of different objects.

COURSE CODE : 21ME2001/21EE2001 COURSE NAME : ENGINEERING PRACTICES LABORATORY	
CO1	Fabricate wooden components and pipe connections including plumbing works.
CO2	Fabricate simple weld joints.
CO3	Fabricate different electrical wiring circuits and understand the AC Circuits.

COURSE CODE : 21HE2071 COURSE NAME : LANGUAGE COMPETENCY ENHANCEMENT	
CO1	Introduced to different modes and types of business communication.
CO2	Practiced to face and react to various professional situations efficiently.
CO3	Learnt to practice managerial skills.
CO4	Familiarized with proper guidance to business writing.
CO5	Trained to analyze and respond to different types of communication

COURSE CODE : 21HE2072 COURSE NAME : CAREER GUIDANCE – LEVEL II	
CO1	Enable students to solve questions on Verbal, Logical and Quantitative Aptitude of placement level

COURSE CODE : 21HE2073 COURSE NAME : ENTREPRENEURSHIP & INNOVATION	
CO1	Understand the nature of business opportunities, resources, and industries in critical and creative aspects.
CO2	Understand the processes by which innovation is fostered, managed, and commercialized.
CO3	Remember effectively and efficiently the potential of new business opportunities.
CO4	Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness..
CO5	Develop a business model for a new venture, including revenue. Margins, operations, working capital, and investment.

SEMESTER III

COURSE CODE : 19MA3102 COURSE NAME : FOURIER ANALYSIS AND TRANSFORMS	
CO1	Understand the principles of Fourier series which helps them to solve physical problems of engineering.
CO2	Employ Fourier series in solving the boundary value problems.
CO3	Understand Fourier series in solving the two dimensional heat equations
CO4	Apply Fourier transform techniques which extend its applications.
CO5	Illustrate the Z- transforms for analyzing discrete-time signals and systems.

COURSE CODE : 19EC3201 COURSE NAME : DIGITAL ELECTRONICS	
CO1	Able to apply the concepts of Boolean theorem to simplify Boolean expressions
CO2	Able to understand the working of various combinational circuits.
CO3	Able to apply the concepts to in various synchronous sequential circuits.
CO4	Able to apply the concepts to in various asynchronous sequential circuits.
CO5	Understand the organization of memories and PLDs.

COURSE CODE : 19EC3202 COURSE NAME : SIGNALS AND SYSTEMS	
CO1	Understand the signal and system classification and properties
CO2	Understand signal spectrum and apply Fourier series to continuous signal spectrum.
CO3	Apply Fourier and Laplace transform in LTI system analysis.
CO4	Apply DTFT to understand the properties of discrete time signals.
CO5	Apply Z-transform for discrete system analysis

COURSE CODE : 19EC3203 COURSE NAME : ELECTRONIC CIRCUITS	
CO1	understand various biasing circuit for bjt and jfet amplifiers and apply in solving the problems
CO2	Understand the low frequency and high frequency response of BJT amplifiers using small signal equivalent circuit.
CO3	Understand the operation of various types of large signal amplifiers and linear wave shaping circuits
CO4	Understand the different types of feedback amplifiers with examples
CO5	Understand various types of oscillators and multivibrators and their applications

COURSE CODE : 19CS3252 COURSE NAME : OOPS USING JAVA	
CO1	To Understand the Basics of java Programming
CO2	Design program using inheritance, interfaces and exception handling.

CO3	Develop applications using packages and multithreading in java
CO4	Implement I/O streams classes and collections in real time applications.
CO5	Design real time applications using Applet, frames and windows

COURSE CODE : 19EC3001 COURSE NAME : ELECTRONIC CIRCUITS LAB	
CO1	Design and analyse the biasing circuits for various amplifier configurations
CO2	Construct and analyse the performance of signal generators for a specified frequency.
CO3	Analyze the performance of electronic circuits using PSPICE.

COURSE CODE : 19EC3002 COURSE NAME : DIGITAL ELECTRONICS LAB	
CO1	Analyze the performance of various combinational circuits.
CO2	Design and develop various synchronous logic circuits.
CO3	Formulate the design procedure of combinational and sequential digital circuits using Hardware Description Language

COURSE CODE : 19AC3191 COURSE NAME : INDIAN CONSTITUTION	
CO1	Understand the functions of the Indian government
CO2	Understand and abide the rules of the Indian constitution.

COURSE CODE : 19HE3072 COURSE NAME : CAREER GUIDANCE – LEVEL III	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

COURSE CODE : 19HE3072 COURSE NAME : CAREER GUIDANCE – LEVEL III	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

COURSE CODE : 19HE3073 COURSE NAME : LEADERSHIP MANAGEMENT SKILLS	
CO1	To practice essential leadership skills in day to day operations
CO2	To work on leadership skills in the study environment
CO3	To understand and develop the skills consciously.
CO4	To know about the real worth of all the skills for success
CO5	To Analyze the real worth of the person and suggestion for improvement

COURSE CODE : 19IT3252 COURSE NAME : RELATIONAL DATABASE MANAGEMENT SYSTEM (RDBMS)	
CO1	Describe the fundamental elements of relational database management systems
CO2	Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
CO3	Improve the database design by normalization.
CO4	Design ER-models to represent simple database application scenarios
CO5	Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.

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COURSE OUTCOMES (COs)

SEMESTER IV

COURSE CODE :19MA4104 COURSE NAME : PROBABILITY AND RANDOM PROCESSES	
CO1	Understand the concepts of random variables.
CO2	Distinguish various discrete and continuous distribution functions.
CO3	Express the phenomenon of two dimensional random variables.
CO4	Apply the fundamental knowledge of the Markov and Poisson processes.
CO5	Apply the concept of Fourier Transform to analyze the response of random inputs to LTI system.

COURSE CODE : 19EC4201R COURSE NAME: ELECTRO MAGNETIC FIELDS AND WAVES	
CO1	Understand the basic laws of electromagnetism.
CO2	Analyze field potentials due to static charges and static magnetic fields.
CO3	Analyze time varying electric and magnetic fields.
CO4	To understand Maxwell's equation in integral, differential and phasor forms
CO5	Explain Electromagnetic wave propagation in Lossy and Lossless media.

COURSE CODE : 19EC4202R COURSE NAME : ANALOG COMMUNICATION	
CO1	Apply the concepts in selecting suitable amplitude modulation techniques for various applications.

CO2	Apply the concepts in selecting appropriate angle modulation techniques for a message signal.
CO3	Understand the impact of noise on communication systems
CO4	Understand the principle and working of different transmitters and receivers
CO5	Apply the concepts in selecting appropriate analog pulse modulation technique for various applications

COURSE CODE : 19EC4203R COURSE NAME : LINEAR INTEGRATED CIRCUITS	
CO1	To understand the characteristics of opamp.
CO2	To understand the various applications of opamp.
CO3	To understand the various wave generating and shaping circuits.
CO4	To apply ADC and DAC for various applications.
CO5	To understand the concept of PLL and voltage regulators

COURSE CODE : 19EC4251 COURSE NAME : CONTROL SYSTEMS	
CO1	To understand the concept of mathematically modeling of control systems.
CO2	To remember the different time domain specifications and implement in the steady state error concept.
CO3	To interpret the concepts of various frequency response plots.
CO4	To understand the concept of the stability of closed loop control system.
CO5	To retrieve the concepts of mathematical modeling and implement in a state variable approach

COURSE CODE : 19EC4001 COURSE NAME : LINEAR INTEGRATED CIRCUITS LAB	
CO1	To apply operational amplifier in linear applications.
CO2	To apply operational amplifiers in nonlinear applications
CO3	To use SPICE software for circuit design.

COURSE CODE : 19EC4002 COURSE NAME : ANALOG COMMUNICATION LABORATORY	
CO1	Analyze the performance of various modulation and demodulation methods.
CO2	Able to interpret the spectral characteristics of the modulated signals
CO3	Able to analyze multiplexing techniques in signal reception

COURSE CODE : 19AC4191 COURSE NAME : ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	
CO1	Identify the concept of Traditional knowledge and its importance
CO2	Explain the need and importance of protecting traditional knowledge.
CO3	Explain the need and importance of Itihas and Dharma Shastra.

CO4	Interpret the concepts of Intellectual property to protect the traditional knowledge.
CO5	Interpret the concepts of indian philosophy to protect the traditional knowledge

COURSE CODE : 19HE4072 COURSE NAME : CAREER GUIDANCE LEVEL IV	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

COURSE CODE : 19HE4073 COURSE NAME : IDEATION SKILLS	
CO1	Develop a strong understanding and importance of ideation
CO2	Learn about the different kinds of tools for Ideation.
CO3	Learn the need and significance of prototyping and its significance.

COURSE CODE : 19CS4204 COURSE NAME : DESIGN THINKING	
CO1	Students develop a strong understanding of the Design Process and how it can be applied in a variety of business settings
CO2	Students learn to build empathy for target audiences from different "cultures"
CO3	Students learn to research and understand the unique needs of a company around specific challenges
CO4	Students learn to develop and test innovative ideas through a rapid iteration cycle

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COURSE OUTCOMES (COs)

SEMESTER V

COURSE CODE : 19EC5201 COURSE NAME : MICROPROCESSOR AND MICRO CONTROLLER	
CO1	Design and implement programs on 8086 microprocessor.
CO2	Design I/O circuits.
CO3	Design Memory Interfacing circuits.
CO4	Design and implement 8051 microcontroller based systems
CO5	Design various interfacing and its programming methodologies

COURSE CODE : 19EC5202 COURSE NAME : TRANSMISSION LINES AND WAVE GUIDES	
CO1	Understand the characteristics of transmission lines and its losses

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CO2	Understand the standing wave ratio and input impedance in high frequency transmission lines
CO3	Understand impedance matching for high frequency lines using smith charts
CO4	Understand the behavior of guided waves between parallel planes
CO5	Understand the Characteristics of guided waves in rectangular and circular waveguides

COURSE CODE : 19EC5203 COURSE NAME : VLSI DESIGN	
CO1	Ability to analyze CMOS and MOS transistors.
CO2	Ability to analyse passive components required for physical design.
CO3	Ability to analyze timing issues of sequential logic
CO4	Ability to understand advanced semiconductor processing materials and data processing architecture.
CO5	Ability to write a program using an efficient model for digital circuits

COURSE CODE : 19EC5251 COURSE NAME : DATA COMMUNICATION AND NETWORKS	
CO1	Demonstrate the networking strategies
CO2	Identify the technical issues related to networking technologies.
CO3	Discriminate various routing techniques.
CO4	Illustrate the web applications
CO5	Implement various network algorithms and protocols

COURSE CODE : 19EC5252 COURSE NAME : DIGITAL SIGNAL PROCESSING	
CO1	Apply DFT for the analysis of digital signals & systems.
CO2	Able to design IIR Butterworth and Chebyshev filters
CO3	Able to design FIR filters.
CO4	Characterize Finite word length effect on filters .
CO5	Design and Implement of Multirate Filters

COURSE CODE : 19EC5001 COURSE NAME : VLSI DESIGN LAB	
CO1	Write HDL code for basic as well as advanced digital integrated circuits.
CO2	Import the logic modules into FPGA Boards and Synthesize digital logics on FPGA
CO3	Design the layouts of Analog IC Blocks using EDA tools.
CO4	Simulate the layouts of Analog IC Blocks using EDA tools.
CO5	Extract the layouts of Analog IC Blocks using EDA tools.

COURSE CODE : 19EC5002 COURSE NAME : MICROPROCESSOR AND MICRO CONTROLLER LABORATORY	
CO1	Write ALP Programmes for fixed and Floating Point and Arithmetic

CO2	Interface different I/Os with processor
CO3	Generate waveforms using Microprocessors.
CO4	Execute Programs in 8051
CO5	Explain the difference between simulator and Emulator

COURSE CODE : 19HE5071 COURSE NAME : SOFT SKILLS - I	
CO1	Students will have clarity on their career exploration process and to match their skills and interests with a chosen career path.
CO2	Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others
CO3	Students will understand how teamwork can support leadership skills
CO4	Students will be able to make sense of problems, develop strategies to find solutions, and persevere in solving them.
CO5	Students will demonstrate an enhanced ability to draw logical conclusions and implications to solve logical problems.

COURSE CODE : 19HE5072 COURSE NAME : DESIGN THINKING	
CO1	Develop a strong understanding of the Design Process
CO2	Learn to develop and test innovative ideas through a rapid iteration cycle.
CO3	Develop teamwork and leadership skills

SEMESTER VI

COURSE CODE : 19EC6181 COURSE NAME : PRINCIPLES OF MANAGEMENT	
CO1	Analyze strategies to handle the given issues in management
CO2	Discuss the nature of decision making process
CO3	Analyze the types of organization structure and departmentation.
CO4	Evaluate the theories of leadership.

CO5	Evaluate the techniques of budgetary and non – budgetary control

COURSE CODE : 19EC6201 **COURSE NAME : DIGITAL COMMUNICATION**	
CO1	Understand the fundamental concepts sampling and pulse modulations
CO2	Design and implement of waveform coding and base band transmission schemes
CO3	Design and implement of various Band pass modulation signaling
CO4	Estimation of errors detection and correction in transmission and reception
CO5	Describe the attractive feature of secure and reliable communication in Spread Spectrum Systems.

COURSE CODE : 19EC6202 **COURSE NAME : ANTENNA AND WAVE PROPAGATION**	
CO1	Understand the radiation phenomena and the antenna parameters
CO2	Understand the radiation characteristics of different types of aperture and slot antennas
CO3	Understand the radiation mechanism of various types of array antennas.
CO4	Understand the purpose on special antennas and some of the basic antenna measurements
CO5	Understand the characteristics of different types of radio wave propagation at different frequencies

COURSE CODE : 19EC6251 **COURSE NAME : EMBEDDED SYSTEMS AND IOT**	
CO1	Design and develop embedded systems.
CO2	Analyze program design and scheduling of the process.
CO3	Design portable IoT using Raspberry Pi /open platform.
CO4	Develop IoT applications using Raspberry Pi/open platform
CO5	Explore deployment platforms for IoT applications.

COURSE CODE : 19EC6001 **COURSE NAME : DIGITAL COMMUNICATION LAB**	
CO1	Able to sampling and reconstruction for given signal.
CO2	Able to multiplex signals without aliasing effect.
CO3	Analyze the performance of various Pulse Modulations and Demodulation
CO4	Able to design and implement the various band pass modulation/demodulation schemes
CO5	Able to design a communication channel.

COURSE CODE : 19EC6701 **COURSE NAME : INTERNSHIP**

CO1	Ability to articulate what was learned and how it will be apply to your professional career goals
CO2	Identification of professions that may be of interest as a result of this experience
CO3	Identification of additional skills that will need to be developed to ensure career readiness. This might include learning a new technology

COURSE CODE : 19HE6071 COURSE NAME : SOFT SKILLS-II	
CO1	Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict.
CO2	Students will Actively participate meetings, Group Discussions / interviews and prepare & deliver presentations
CO3	Students will define professional behavior and suggest standards for appearance, actions and attitude in a Business environment
CO4	Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.
CO5	Students will excel in complex reasoning.

COURSE CODE : 19HE6072 COURSE NAME : INTELLECTUAL PROPERTY RIGHTS (IPR)	
CO1	Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.
CO2	Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.
CO3	Identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing.
CO4	Identify different types of trademarks and procedure for registration
CO5	Recognize the concept of design, geographical indication and procedure for registration

PROFESSIONAL ELECTIVES

COURSE CODE : 19EC5301 COURSE NAME : MEASUREMENTS AND INSTRUMENTATION	

CO1	Understand the measurements concept and usage of AC/DC bridges.
CO2	Explore knowledge on Electronic Instruments.
CO3	Explain the different types of Signal generators and CRO.
CO4	Identify various types of transducers and their working.
CO5	Learn the various process of computer controlled instrumentation

COURSE CODE : 19EC5302 COURSE NAME : PCB DESIGN	
CO1	Explain the basics PCB and layout design considerations.
CO2	Enumerate PCB Design considerations in Special circuits.
CO3	Enhance the knowledge in image transfer, plating and Etching techniques in PCBs.
CO4	Recognize the various Technologies in Printed Circuit boards.
CO5	Summarize the PCB technology trends.

COURSE CODE :19EC5303 COURSE NAME : RF SYSTEM DESIGN	
CO1	Describe the various passive and active components for radio frequency circuits
CO2	Design and analyze microstrip line filters
CO3	Design matching networks using Smith chart
CO4	Design biasing circuits for RF amplifiers
CO5	Describe various RF oscillators, Mixers, power dividers and couplers.

COURSE CODE : 19EC5304 COURSE NAME : NETWORK SECURITY	
CO1	Analyze and apply the appropriate Cryptographic technique to overcome the security attacks.
CO2	Categorize Symmetric and asymmetric ciphers .
CO3	Develop Symmetric and asymmetric ciphers.
CO4	Develop a secured system with authentication and integrity services
CO5	Apply the necessary internet security algorithm for various applications

COURSE CODE : 19EC5181 COURSE NAME : TOTAL QUALITY MANAGEMENT	
CO1	To make the students clear about the quality concepts.
CO2	The different contributions of quality experts
CO3	To apply the quality philosophies and tools
CO4	To facilitate continuous improvement practices and ensure customer delight
CO5	To make them understand the importance of quality awards as a competitive advantage.

COURSE CODE : 19EC6301 COURSE NAME : MEDICAL ELECTRONICS

CO1	Know the human body electro- physiological parameters and recording of bio-potentials.
CO2	Comprehend the non-electrical physiological parameters and their measurement – body temperature, blood pressure, pulse, blood cell count, blood flow meter etc
CO3	Interpret the various assist devices used in the hospitals viz. pacemakers, defibrillators, dialyzers and ventilators
CO4	Understand the physical medicine methods eg. ultrasonic, shortwave, microwave surgical diathermies , and bio-telemetry principles and methods
CO5	Discuss about recent trends in medical instrumentation

COURSE CODE : 19EC6302 COURSE NAME : INDUSTRIAL AUTOMATION	
CO1	Emphasize the signals from automation components and machine elements.
CO2	Explain the concepts of SCADA Communication and protocols
CO3	Familiarize the concept of Distribution Network Protocol and IEC standard.
CO4	Explain the need for M2M to Internet of Things.
CO5	Familiarize the concepts of Modern Industrial Automation

COURSE CODE : 19EC6303 COURSE NAME : MOBILE COMMUNICATIONS	
CO1	Describe the cellular concept of wireless communication system.
CO2	Illustrate the behavior of the wireless channel and its impact on system design
CO3	Interpret the mathematical modelsof propagation in wireless communications
CO4	Understand the wireless systems and standards in wireless communication.
CO5	Explore relevance of multiple layers and their functionalities.

COURSE CODE : 19EC6304 COURSE NAME : HIGH SPEED NETWORKS	
CO1	Interpret ATM and Frame relay networks
CO2	Describe the concepts of congestion and traffic management
CO3	Analyze the Quality of service in IP Networks.
CO4	Infer the Principle of wireless network operation and compression
CO5	Summarize the Network management and application

COURSE CODE : 19EC6305 COURSE NAME : VIRTUAL REALITY AND AUGMENTED REALITY	
CO1	Select the appropriate input output device for an application.
CO2	Apply the suitable modelling for the given problem statement.
CO3	Design appropriate VR content for an application.
CO4	Construct the building blocks for VR in mobile and web.

CO5	Analyse & Design VR systems for various applications.

COURSE CODE : 19EC6182 **COURSE NAME : E-COMMERCE TECHNOLOGY**	
CO1	Understand the basic concepts and technologies used in the field of management information systems
CO2	Identify and apply relevant problem-solving methodologies
CO3	Design components, systems and/or processes to meet required specifications
CO4	Evaluate the Internet marketing Strategies
CO5	Demonstrate research skills

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COURSE OUTCOMES (COs)

OPEN ELECTIVES

COURSE CODE : 19EC6401 **COURSE NAME : CONSUMER ELECTRONICS**	
CO1	Understand electronics engineering concepts used in audio systems.
CO2	Identify and explain working of various colour TV and Display blocks.
CO3	Understand the basic functions of various domestic and consumer electronic goods.
CO4	Understand various types of power supplies, Remote and RFID.
CO5	Use different product safety, compliance standards and techniques associated with electronic products

HICET	PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	ELECTRONICS AND COMMUNICATION ENGINEERING
PROGRAMME NAME	B.E ECE
REGULATIONS	R2016

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO1	Exhibit their technical skills and knowledge in their working environment, higher studies and research
PEO2	Succeed in multidisciplinary dimensions by excelling through life-long learning.
PEO3	Become leaders and innovators by devising engineering solutions for social issues and problems.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

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 considerations for the public health and safety, and the cultural, societal and environmental consideration.
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 environment.
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.

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COURSE OUTCOMES (COs)

SEMESTER VII

COURSE CODE : 16EC7201 COURSE NAME : EMBEDDED AND REAL TIME SYSTEMS	
CO1	Describe the architecture and programming of ARM processor.
CO2	Explain the basic concepts of real time Operating system design.
CO3	Use the system design techniques to develop software for embedded systems
CO4	Differentiate general purpose operating system and the real time operating system
CO5	Model real-time applications using embedded-system concepts

COURSE CODE : 16EC7202 COURSE NAME : WIRELESS COMMUNICATION	
CO1	Design a cellular system based on resource availability and traffic demands.
CO2	Characterize a wireless channel and evolve the system design specifications.
CO3	Able to identify suitable modulation technique for the wireless channel and system under consideration.
CO4	Implement an appropriate multiple access protocol for the wireless channel.
CO5	Exploit multiple antenna techniques for capacity/ performance gains

COURSE CODE : 16EC7203 COURSE NAME: MICROWAVE ENGINEERING	
CO1	Gain proficiency in characterizing multi port networks.
CO2	Compare various microwave semiconductor devices.
CO3	Analyze various waveguide components.
CO4	Analyze the performance of Microwave tubes.
CO5	Identify the measurement techniques for different parameters like VSWR, impedance ,etc

COURSE CODE : 16EC7001 COURSE NAME : EMBEDDED SYSTEMS LAB	
CO1	Efficient Real time signal processing using processors by adopting the ADC / DAC process.
CO2	Fast Data transfer between memory and processor using memory interfacing concept.
CO3	Handling the real time parameters by adopting a suitable Interrupt

	handling technique.
CO4	Interface various components.
CO5	Generate interrupts in FPGA

COURSE CODE : 16EC7002 **COURSE NAME : OPTICAL COMMUNICATION AND MICROWAVE LAB**	
CO1	Analyze the performance of various microwave links.
CO2	Analyze the performance of various optical links.
CO3	Test microwave components
CO4	Analyze the radiation of pattern of antenna.
CO5	Test optical components

COURSE CODE : 16EC7701 **COURSE NAME : TECHNICAL SEMINAR/IMPLANTTRAINING /CERTIFICATION COURSE/INTERNSHIP**	
CO1	Ability to enrich the competitive knowledge of the students to develop their personality
CO2	Enabling the students to gain a competitive edge in the recruitment process
CO3	Grooming their confidence in the society

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	**COURSE OUTCOMES (COs)**

SEMESTER VIII

COURSE CODE : 16EC8901 **COURSE NAME : PROJECT WORK**	
CO1	Gain Career related experience and practical knowledge
CO2	Opportunity to explore career avenues
CO3	Valuable work experience for their resumes
CO4	Potential to earn academic credit
CO5	Increase self-confidence and Enhance conventional classroom learning methods

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PROFESSIONAL ELECTIVES

COURSE CODE : 16EC7301 COURSE NAME : EMBEDDED CONTROLLERS	
CO1	Knowledge of advanced Embedded Controllers
CO2	Identify the open source Embedded Controllers
CO3	Discriminate various possible interfacing techniques
CO4	Develop a real time system based on Embedded Controllers
CO5	Discover the advantages of Advanced Embedded Controller Boards.

COURSE CODE : 16EC7302 COURSE NAME : FIBER OPTIC COMMUNICATION	
CO1	Discuss the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber.
CO2	Analyze the reasons for signal degradation in optical fiber.
CO3	Identify the various optical sources and optical detectors and their use in the optical communication system.
CO4	Measure and analyze various fiber optic fiber parameters.
CO5	Analyze the digital transmission and its associated parameters on system performance

COURSE CODE : 16EC7303 COURSE NAME : HIGH SPEED NETWORKS	
CO1	Interpret ATM and Frame relay networks
CO2	Describe the concepts of congestion and traffic management
CO3	Analyze the Quality of service in IP Networks.
CO4	Infer the Principle of wireless network operation and compression
CO5	Summarize the Network management and application

COURSE CODE : 16EC7304 COURSE NAME : INTERNET AND JAVA	
CO1	Compare various networking protocols.
CO2	Design a network with available routing algorithms.
CO3	Discover the advantages of World Wide Web with the developing tools.
CO4	Knowledge of JAVA and the programming concepts.
CO5	Develop JAVA based applications.

COURSE CODE : 16EC7305 COURSE NAME : MOBILE COMMUNICATION	
CO1	Choose appropriate Multiplexing for Mobile computing
CO2	Analyze the IEEE standard for the various Wireless networks.
CO3	Describe the location tracking and mobility management in GSM and GPRS
CO4	Apply Mobile IP and Snooping TCP for Mobile networks.
CO5	Develop WAP model for Application layer.

COURSE CODE : 16EC7306

COURSE NAME : SATELLITE COMMUNICATION	
CO1	To analyze the basic concepts in satellite communication
CO2	To differentiate various subsystems .
CO3	To understand the concept of uplink and downlink.
CO4	To understand multiple access techniques.
CO5	Identify different types of broadcasting/military applications

COURSE CODE : 16EC7307 COURSE NAME : ARTIFICIAL INTELLIGENCE	
CO1	Implement machine learning through neural networks.
CO2	Gain Knowledge to develop Genetic Algorithm and Support vector machine based machine learning system
CO3	Write Genetic Algorithm to solve the optimization problem
CO4	Understand fuzzy concepts and develop a Fuzzy expert system to derive decisions.
CO5	Able to Model Neuro Fuzzy system for data clustering and classification.

COURSE CODE : 16EC7308 COURSE NAME : ASIC DESIGN	
CO1	Gained knowledge in the circuit design aspects at the transistor and block level abstractions of FPGA
CO2	Gained knowledge in the circuit design aspects at the transistor and block level abstractions of ASIC
CO3	Design the ASIC design flow is dealt with from the circuit and layout design point of view
CO4	Design the FPGA design flow is dealt with from the circuit and layout design point of view
CO5	Gained knowledge in FPGA and ASIC Logic synthesis - floor planning-placement and routing

COURSE CODE : 16EC7309 COURSE NAME : LOW POWER VLSI	
CO1	To differentiate the various sources of power
CO2	To analyzethe the different techniques in low power design.
CO3	To identify the power reduction techniques based on technology independent and technology dependent Power dissipation mechanism in various MOS logic style.
CO4	To analyze suitable techniques to estimate the power dissipation
CO5	To design memory circuits with low power dissipation

COURSE CODE : 16EC7310 COURSE NAME : NETWORKS ON CHIP	
CO1	To Learn the concept of 3D NOC, architectures and protocols of 3D NOC.
CO2	To Understand the types of fault and study the testing methods for fault rectification.

CO3	To know the types of Energy and Power Issues of NOC.
CO4	To Analyze micro-architecture NOC.
CO5	To Know the concept of DimDE router for 3D NOC

COURSE CODE : 16EC7311 COURSE NAME : OPTIMIZATION TECHNIQUES	
CO1	Demonstrate and solve various optimization techniques.
CO2	Learn the basic concepts of linear programming.
CO3	Apply the dynamic programming method for current scenario problems.
CO4	Work on non-linear programming techniques.
CO5	Construct the interior point methods of solving problems.

COURSE CODE : 16EC7312 COURSE NAME : ROBOTICS	
CO1	Discuss the Architecture of robotic systems.
CO2	Illustrate the Mechanical grippers and Control system of Robot.
CO3	Differentiate the various Robot Transformations And Sensors.
CO4	Apply Robot cell design and control-Sequence for various application.
CO5	Construct the Micro and Nan robotics using scaling with Top down and Bottom up approach .

COURSE CODE : 16EC8301 COURSE NAME : ARM SYSTEM ARCHITECTURE AND APPLICATIONS	
CO1	Describe the ARM microprocessor architectures and its feature.
CO2	Interface the advanced peripherals to ARM based microcontroller
CO3	Design embedded system with available resources.
CO4	Design of embedded arm cortex processors.
CO5	Interpret the applications of real time world applications

COURSE CODE : 16EC8302 COURSE NAME : AUTOMOTIVE ELECTRONICS	
CO1	Acquire knowledge about fundamentals of Automotive Electronics
CO2	Understand the working principle, construction of starting system
CO3	Discriminate about the working principle, construction, characteristics of charging system
CO4	Gain knowledge about working principle, construction, characteristics, Capacity, Efficiency and various tests on Lead Acid Battery
CO5	Discover the concepts of various types of Sensors and Activators

COURSE CODE: 16EC8303 COURSE NAME : E-COMMERCE TECHNOLOGY	
CO1	Explain value chain in E-commerce
CO2	Analyze the suitable web client and server, through appropriate protocol
CO3	Experiment on web servers using software tool.

CO4	Develop the good security for digital payments.
CO5	Use web based marketing and online advertisement to achieve the maximum

COURSE CODE : 16EC8304 COURSE NAME : ENTREPRENEURSHIP DEVELOPMENT	
CO1	Choose the entrepreneurial career.
CO2	Defend the motivation factors for the entrepreneurship.
CO3	Evaluate the effectiveness of a business plan and model.
CO4	Assess the taxes and the finance of a concern.
CO5	Relate the supports and partnerships with respect the given scenario

COURSE CODE : 16EC8305 COURSE NAME : INDUSTRIAL AUTOMATION	
CO1	Design signal conditioning circuits for Temperature measurement.
CO2	Design suitable interface logic and data acquisition system for real time signal processing
CO3	Design a control unit employing PLC logic.
CO4	Select a suitable DCS for real time requirements.
CO5	Gain knowledge on HART networks and Protocols

COURSE CODE : 16EC8306 COURSE NAME : REAL TIME OPERATING SYSTEMS	
CO1	Discuss the operating system structure and system functions
CO2	Indentify the critical section problem– CPU scheduling and Dead Locks.
CO3	Explain the principles of memory allocation– segmentation and paging.
CO4	Distinguish between Event based and process based models.
CO5	Apply various models for Real time Applications.

COURSE CODE : 16EC8307 COURSE NAME : DISASTER MANAGEMENT	
CO1	Capacity to integrate knowledge to manage the different public health aspects of disaster events at a local and global levels, even when limited information is available.
CO2	Capacity to analyse, and evaluate the different public health aspects of disaster events at a local and global levels, even when limited information is available.
CO3	Capacity to describe the environmental, social, cultural, economic, legal and organisational aspects influencing vulnerabilities and capacities to face disasters.
CO4	Capacity to analyse and evaluate the environmental, social, cultural, economic, legal and organisational aspects influencing vulnerabilities and capacities to face disasters.
CO5	Capablity to manage the Public Health aspects of the disasters

COURSE CODE : 16EC8308 COURSE NAME : FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT	
CO1	To understand the integration of customer requirements in product design.
CO2	To apply structural approach to concept generation, selection and testing.
CO3	To understand various aspects of design such as industrial design.
CO4	To know the design methods for manufacture.
CO5	To infer economic analysis and product architecture

COURSE CODE : 16EC8309 COURSE NAME : INTELLECTUAL PROPERTY RIGHTS AND INNOVATIONS	
CO1	To gain knowledge on IPR.
CO2	To know concept of Patents and copyrights.
CO3	To understand the concepts of WIPO and GATT.
CO4	To infer the Strategies and legislations of IPR.
CO5	To analyze Patents, Copyright and related rights by various case studies

COURSE CODE : 16EC8310 COURSE NAME : OPERATIONS RESEARCH	
CO1	Select optimal problems, solving techniques to manage projects.
CO2	Define and formulate replacement models.
CO3	Solve different problems related to Network.
CO4	Formulate and solve optimization problems related to job/ work assignments.
CO5	Choose appropriate queuing model for practical application.

COURSE CODE : 16EC8311 COURSE NAME : TOTAL QUALITY MANAGEMENT	
CO1	Describe the basic concepts of Total quality management.
CO2	Interpret the various principles, practices of TQM to achieve quality.
CO3	Infer the various statistical approaches for Quality control.
CO4	Develop the TQM tools for continuous process improvement.
CO5	Summarize the importance of ISO Certifications

COURSE CODE : 16EC8312 COURSE NAME : VLSI SIGNAL PROCESSING	
CO1	Attain knowledge about signal DSP Systems.
CO2	Know the properties of retiming , unfolding algorithms.
CO3	Design fast convolution algorithms.
CO4	Realize suitable digital lattice filter structures.
CO5	Design bit level arithmetic architectures

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COURSE OUTCOMES (COs)

OPEN ELECTIVES

COURSE CODE : 16EC7402 COURSE NAME : INTERNET OF THINGS	
CO1	Describe IoT with various tools.
CO2	Design a portable IoT using Arduino/ equivalent boards and relevant protocols.
CO3	Develop web services to access/control IoT devices.
CO4	Deploy an IoT application and connect to the cloud.
CO5	Analyze applications of IoT in real time scenario

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)**

DEPARTMENT NAME	ELECTRONICS AND INSTRUMENTATION ENGINEERING
PROGRAMME NAME	B.E
REGULATIONS	R2019

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO1	have strong foundation in basic science and mathematics to formulate, analyze and solve electronics and instrumentation problems.
PEO2	have good knowledge of instrumentation systems and their applications to design control and safety systems for industrial process.
PEO3	exhibit professionalism with ethics, communication and team work to satisfy the needs of the society.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

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 modeling 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.

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COURSE OUTCOMES (COs)

PROGRAM NAME – ELECTRONICS AND INSTRUMENTATION ENGINEERING

Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSE CODE : 21HE1101 COURSE NAME : TECHNICAL ENGLISH	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	Acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE :21MA1103 COURSE NAME : CALCULUS AND DIFFERENTIAL EQUATIONS	
CO1	Apply the concept of differentiation in any curve.
CO2	Identify the maximum and minimum values of surfaces.
CO3	Apply double integrals to compute the area of plane curves.
CO4	Evaluation of triple integrals to compute volume of solids.
CO5	Develop sound knowledge of techniques in solving ordinary differential equations that model engineering problems.

COURSE CODE : 21PH1151 COURSE NAME : APPLIED PHYSICS	
CO1	Illustrate the fundamental properties of matter
CO2	Discuss the Oscillatory motions of particles
CO3	Analyze the wavelength of different colors
CO4	Understand the advanced technology of LASER in the field of Engineering
CO5	Develop the technology of fiber optical communication in engineering field

COURSE CODE : 21CY1151 COURSE NAME : CHEMISTRY FOR ENGINEERS	
CO1	Differentiate hard and soft water and to solve the related problems on water purification and its significance in industries and daily life.
CO2	Acquire the basic knowledge of polymers, composites and FRP and their significance.

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CO3	Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences to minimize corrosion to improve industrial design.
CO4	Develop knowledge about the renewable energy resources and batteries along with the need of new materials to improve energy storage capabilities.
CO5	Identify the structure and characteristics of unknown/new compound with the help of spectroscopy

COURSE CODE : 21CS1151 **COURSE NAME : PYTHON PROGRAMMING AND PRACTICES**	
CO1	Develop algorithmic solutions to simple computational problems
CO2	Read, write, execute by hand simple Python programs
CO3	Structure simple Python programs for solving problems and Decompose a Python program into functions
CO4	Represent compound data using Python lists, tuples, dictionaries
CO5	Read and write data from/to files in Python Programs.

COURSE CODE : 21ME1152 **COURSE NAME : ENGINEERING DRAWING**	
CO1	Understand and interpret the engineering drawings in order to visualize the objects and draw the conics and special curves.
CO2	Draw the orthogonal projections of straight lines and planes.
CO3	Interpret the projections of simple solid objects in plan and elevation.
CO4	Draw the projections of section of solids and development of surfaces of solids.
CO5	Draw the isometric projections and the perspective views of different objects.

COURSE CODE : 21HE1001 **COURSE NAME : LANGUAGE COMPETENCY ENHANCEMENT COURSE- I**	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication
CO3	Introduced to gain information of the professional world.
CO4	acquired various types of communication and etiquette
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE : 21HE1072 **COURSE NAME : CAREER GUIDANCE LEVEL I**	
CO1	Enable students to approach learning Aptitude with ease, and understand recruiter expectation.

COURSE CODE : 21HE1073 **COURSE NAME : ENTREPRENEURSHIP & INNOVATION**	
CO1	Understand the nature of business opportunities, resources, and industries in critical and creative aspects.

CO2	Understand the processes by which innovation is fostered, managed, and commercialized.
CO3	Remember effectively and efficiently the potential of new business opportunities.
CO4	Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness..
CO5	Develop a business model for a new venture, including revenue. Margins, operations, working capital, and investment.

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COURSE OUTCOMES (COs)

SEMESTER II

COURSE CODE : 21HE2101 COURSE NAME : BUSINESS ENGLISH FOR ENGINEERS	
CO1	To know different modes of business communication.
CO2	To understand managerial techniques.
CO3	To apply the rules of grammar and vocabulary in effective business communication.
CO4	To analyse and interpret business documents.
CO5	To draft business reports

COURSE CODE : 21MA2102 COURSE NAME : COMPLEX VARIABLES AND TRANSFORM CALCULUS	
CO1	Calculate Eigen values and Eigen vectors for a matrix, which are used to determine the natural frequencies.
CO2	Solve Partial Differential Equations using various methods.
CO3	Infer the knowledge of construction of analytic functions and conformal mapping.
CO4	Evaluate real and complex integrals over suitable closed paths or contours.
CO5	Apply Laplace transform and its properties to solve certain linear differential equations.

COURSE CODE : 21PH2151 COURSE NAME : MATERIAL SCIENCE	
CO1	Understand the purpose of acceptor or donor levels and the band gap of a semiconductor
CO2	Interpret the basic idea behind the process of magnetism and its applications in everyday
CO3	Discuss the behavior of super conducting materials
CO4	Illustrate the types and importance of crystal systems

CO5	Evaluate the production of ultrasonics and its applications in NDT

COURSE CODE : 21CY2151 **COURSE NAME : ENVIRONMENTAL STUDIES**	
CO1	Realise the importance of ecosystem and biodiversity for maintaining ecological balance.
CO2	Understand the causes of environmental pollution and hazards due to manmade activities.
CO3	Develop an understanding of different natural resources including renewable resources.
CO4	Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues.
CO5	Gain knowledge about the importance of women and child education and know about the existing technology to protect environment

COURSE CODE : 21CS2152 **COURSE NAME : ESSENTIALS OF C AND C++ PROGRAMMING**	
CO1	Able to develop simple applications in C using basic constructs.
CO2	Able to apply solutions to real world problems using basic characteristics of C++.
CO3	Able to write object-oriented programs using operator overloading, constructors and destructors.
CO4	Able to develop programs with the concepts of inheritance and polymorphism.
CO5	Able to understand and define with C++ advanced features such as templates and exception handling

COURSE CODE : 21EI2151 **COURSE NAME : CIRCUIT THEORY (COMMON TO EIE AND EEE)**	
CO1	Apply basic laws to electrical circuits.
CO2	Solve electrical circuits using network theorems.
CO3	Explain the concept of resonance and solve coupled circuit problems.
CO4	Carryout problems in DC and AC transients.
CO5	Analyse and calculate three phase AC circuit parameters

COURSE CODE : 21ME2001/ 21EE2001 **COURSE NAME : ENGINEERING PRACTICES LABORATORY**	
CO1	Fabricate wooden components and pipe connections including plumbing works.
CO2	Fabricate simple weld joints.
CO3	Fabricate different electrical wiring circuits and understand the AC Circuits

COURSE CODE : 21HE2001

COURSE NAME : LANGUAGE COMPETENCY ENHANCEMENT COURSE – II	
CO1	Introduced to different modes and types of communication..
CO2	Practiced to face and react to various professional situations efficiently
CO3	learnt to practice managerial skills
CO4	Familiarized with proper guidance to writing
CO5	Trained to analyze and respond to different types of communication

COURSE CODE : 21HE2072 COURSE NAME : CAREER GUIDANCE LEVEL II	
CO1	Enable students to solve questions on Verbal, Logical and Quantitative Aptitude of placement level

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COURSE OUTCOMES (COs)

SEMESTER III

COURSE CODE : 21MA3102 COURSE NAME : FOURIER ANALYSIS AND TRANSFORMS	
CO1	Understand the principles of Fourier series which helps them to solve physical problems of engineering.
CO2	Employ Fourier series in solving the boundary value problems.
CO3	Understand Fourier series in solving the two dimensional heat equations.
CO4	Apply Fourier transform techniques which extend its applications.
CO5	Illustrate the Z- transforms for analyzing discrete-time signals and systems.

COURSE CODE : 21EI3201 COURSE NAME : ELECTRONIC DEVICES AND CIRCUITS (COMMON TO EIE AND EEE)	
CO1	Apply the knowledge acquired about electronic devices.
CO2	Summarize the concepts of transistors.
CO3	Transform the acquired skill in designing a circuit.
CO4	Illustrate the nature of large signal amplifiers.
CO5	Outline the concepts of feedback amplifiers, conditions for oscillation and types of oscillators

COURSE CODE : 21EI3202 COURSE NAME : SENSORS AND TRANSDUCERS

CO1	Definition of errors, error analysis and characteristics response of different order transducers.
CO2	In-depth knowledge about resistive transducers.
CO3	Outline an adequate knowledge about various inductive transducers
CO4	Make use of capacitive transducers on industrial parameters measurement.
CO5	Summarize the role of different industrial transducers and sensors.

COURSE CODE : 21ME3231 COURSE NAME : FLUID MECHANICS AND THERMAL ENGINEERING	
CO1	Understand the fluid properties and its applications.
CO2	Quantify the energy conversion in various hydraulic systems.
CO3	Understand the thermodynamic principles and its applications
CO4	Understand the process of air standard cycles
CO5	Understand about the performance of Thermal and fluid machineries.

COURSE CODE : 21EI3251 COURSE NAME : ELECTRICAL AND ELECTRONIC MEASUREMENTS (COMMON TO EIE AND EEE)	
CO1	Definition of errors, error analysis and characteristics response of different order transducers.
CO2	In-depth knowledge about resistive transducer
CO3	Outline an adequate knowledge about various inductive transducers.
CO4	Make use of capacitive transducers on industrial parameters measurement.
CO5	Summarize the role of different industrial transducers and sensors.

COURSE CODE : 21EI3001 COURSE NAME : ELECTRONIC DEVICES AND CIRCUITS LABORATORY (COMMON TO EIE AND EEE)	
CO1	Understand the characteristics of semiconductor devices.
CO2	Develop various electronic circuit configurations.
CO3	Demonstrate the frequency response of amplifiers.
CO4	Examine the current series feedback amplifier and RC phase shift oscillator.
CO5	Construct and testing the of rectifier circuits.

COURSE CODE : 21EI3002 COURSE NAME : SENSORS AND TRANSDUCERS LABORATORY	
CO1	Make use of sensors and transducers to measure the industrial parameters.
CO2	Analyze the characteristics of different transducers.
CO3	Discuss the various techniques of active and passive element measurements.
CO4	Represent the designing knowledge in signal conditioning circuits.
CO5	Impart knowledge to the students in handling the different kinds of transducers which they often meet in different aspects of transducers.

COURSE CODE : 19MC3191 COURSE NAME : INDIAN CONSTITUTION	
CO1	Understand the functions of the Indian government
CO2	Understand and abide the rules of the Indian constitution.

COURSE CODE : 21HE2072 COURSE NAME : CAREER GUIDANCE LEVEL III	
CO1	Enable students to solve questions on Verbal, Logical and Quantitative Aptitude of placement level

COURSE CODE : 19HE3073 COURSE NAME : LEADERSHIP MANAGEMENT SKILLS	
CO1	To practice essential leadership skills in day to day operations
CO2	To work on leadership skills in the study environment
CO3	To understand and develop the skills consciously.
CO4	To know about the real worth of all the skills for success
CO5	To Analyze the real worth of the person and suggestion for improvement

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COURSE OUTCOMES (COs)

SEMESTER IV

COURSE CODE : 21MA4101 COURSE NAME : NUMERICAL METHODS	
CO1	Solve the system of linear algebraic equations which extends its applications in the field of engineering
CO2	Apply various methods to find the intermediate values for the given data.
CO3	Identify various methods to perform numerical differentiation and l integration
CO4	Classify and solve ordinary differential equations by using single and multi step methods.
CO5	Illustrate various methods to find the solution of ordinary and partial differential equations.

COURSE CODE : 21EI4201 COURSE NAME: ELECTRICAL MACHINES	
CO1	State the principle of operation and construction of D.C. machines
CO2	Ability to write the transformers operation and construction
CO3	List the operation of synchronous machines

CO4	Explain the operation and control of induction machines
CO5	Illustrate the operation of special electrical machines

COURSE CODE : 21EI4202 COURSE NAME : INTEGRATED CIRCUITS AND ITS APPLICATIONS (COMMON TO EIE AND EEE)	
CO1	Interpret the IC fabrication procedure.
CO2	Analyze the characteristics of operational amplifiers.
CO3	Outline the applications of OP-AMP
CO4	Understand the working principle of special IC's.
CO5	Outline the function of voltage regulator as special IC's.

COURSE CODE : 21EI4203 COURSE NAME : INDUSTRIAL INSTRUMENTATION-I	
CO1	Interpret the measurement of pressure in instrumentation
CO2	Choose the instruments used for the measurement of level.
CO3	Identify the methods used for the measurement of temperature
CO4	Choose the High temperature measuring instruments
CO5	Classify the Instruments used for measurement of Viscosity, Humidity, Density and Moisture

COURSE CODE : 21EI4251 COURSE NAME : DIGITAL LOGIC CIRCUITS (COMMON TO EIE AND EEE)	
CO1	Apply the knowledge acquired about Boolean functions.
CO2	Summarize the concepts of combinational circuits.
CO3	Transform the acquired skill in designing the synchronous sequential circuits.
CO4	Ability to understand and analyze the asynchronous sequential circuits.
CO5	Outline the concepts of HDL

COURSE CODE : 21EI4001 COURSE NAME : ELECTRICAL MACHINES LABORATORY	
CO1	Demonstrate the principle of DC generators, DC motors
CO2	Explain the principle and to conduct test on transformers.
CO3	Validate suitable test to compute the characteristics of motors.
CO4	Establish suitable experiments on generators
CO5	Demonstrate about starting methods of motors.

COURSE CODE : 21EI4002 COURSE NAME : INTEGRATED CIRCUITS LABORATORY (COMMON TO EEE AND EIE)	
CO1	Understand the performance characteristics of Op-amp.

CO2	Implementation of various applications of Op-amp.
CO3	Understand the performance of filters and converters.
CO4	Construct multivibrator and regulated power supply circuits using IC
CO5	Assimilate the knowledge on VCO and PLL ICS.

COURSE CODE : 19MC4191 COURSE NAME : ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE/ VALUE EDUCATION	
CO1	Ability to understand the structure of Indian system of life.
CO2	Connect up and explain basics of Indian Traditional knowledge in modern scientific perspective

COURSE CODE : 19HE4072 COURSE NAME : CAREER GUIDANCE LEVEL IV	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays

COURSE CODE : 19HE4073 COURSE NAME IDEATION SKILLS	
CO1	Develop a strong understanding and importance of ideation
CO2	Learn about the different kinds of tools for Ideation.
CO3	Learn the need and significance of prototyping and its significance

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COURSE OUTCOMES (COs)

SEMESTER V

COURSE CODE : 21EI5201 COURSE NAME : INDUSTRIAL INSTRUMENTATION - II	
CO1	Identify the methods of force and torque measurements
CO2	Understand the operation of mechanical flow meter.
CO3	Understand the operation of electrical and other flow meter.
CO4	Choose the instruments for displacement and angle measurement
CO5	Differentiate the speed and velocity measuring instruments. Outline sound measurement.

COURSE CODE : 21EI5202 COURSE NAME : CONTROL SYSTEMS	
CO1	Apply the gained knowledge for modeling of mechanical, electrical control systems.

CO2	Deduct the different order systems with various inputs and their response.
CO3	Estimate the various frequency domain specifications by phase analysis.
CO4	Investigate the control systems stability and compensator design.
CO5	Develop a state models and discrete control systems for any application.

COURSE CODE : 21EI5203 COURSE NAME : MICROPROCESSORS AND MICROCONTROLLERS (COMMON TO EIE AND EEE)	
CO1	Study the architecture of 8085 microprocessor and programming concept involved in 8085.
CO2	Understand the architecture and programming concepts of 8051 microcontroller.
CO3	Understand the commonly used peripheral/ interfacing IC's with its programming.
CO4	Learn the advanced controller fundamentals and programming.
CO5	Understand the applications and role of advanced microcontrollers.

COURSE CODE : 21EI5204 COURSE NAME : ANALYTICAL INSTRUMENTATION	
CO1	Understand the principle of Spectrophotometers
CO2	Identify liquid and gas chromatographic techniques.
CO3	Gain knowledge about industrial gas analyzers.
CO4	Analyze pH measurements and Impart awareness on safety Measures
CO5	Explain the principle of nuclear magnetic resonance and microscopic techniques.

COURSE CODE : 21EI5251 COURSE NAME : PROGRAMMABLE LOGIC CONTROLLERS AND SCADA	
CO1	Describe the architecture of PLCs with the analogy of relay logic components
CO2	Develop ladder logic program for any applications
CO3	Characterize the different instructions available in PLC and implement them.
CO4	Explain on SCADA, DCS and its networking with PLC.
CO5	Summarize the impact on PLC and SCADA for various industrial automation processes.

COURSE CODE : 21EI5001 COURSE NAME : INDUSTRIAL INSTRUMENTATION LABORATORY	
CO1	Illustrate the characteristics of Pressure, Temperature, flow, level, density and viscosity measurements.
CO2	Analyze the measured value for displaying or controlling the physical variables
CO3	Categorise different field instruments for different applications.

CO4	Demonstrate the principles involved in different measuring techniques.
CO5	Examine the bio medical related measuring devices.

COURSE CODE : 21EI5002 COURSE NAME : MICROPROCESSORS AND MICROCONTROLLERS LABORATORY (COMMON TO EIE AND EEE)	
CO1	Understand the 8085 & 8051 programming execution.
CO2	Learn interfacing knowledge with different applications.
CO3	Understand the Interfacing and basic programming concept of Arduino.
CO4	Understand the Interfacing and basic programming concept of Arduino.
CO5	Understand the industrial application of microcontroller by various programming concepts

COURSE CODE : 19HE5071 COURSE NAME : SOFT SKILLS	
CO1	Students will have clarity on their career exploration process and to match their skills and interests with a chosen career path.
CO2	Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others
CO3	Students will understand how teamwork can support leadership skills
CO4	Students will be able to make sense of problems, develop strategies to find solutions, and persevere in solving them.
CO5	Students will demonstrate an enhanced ability to draw logical conclusions and implications to solve logical problems.

COURSE CODE : 19HE5072 COURSE NAME : DESIGN THINKING	
CO1	Develop a strong understanding of the Design Process
CO2	Learn to develop and test innovative ideas through a rapid iteration cycle.
CO3	Develop teamwork and leadership skills

PROFESSIONAL ELECTIVE - I

COURSE CODE : 19EI5301 COURSE NAME : POWER PLANT INSTRUMENTATION	
CO1	Outline the various methods of power generation.
CO2	Correlate the important measurement of various parameters instruments associated with power plants.
CO3	Identify the appropriate control loop in boilers.
CO4	Appraise the burner and furnace management for boilers.
CO5	Outline the operation of turbines.

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COURSE CODE : 19EI5302 COURSE NAME : COMMUNICATION THEORY	
CO1	Describe the concept and generation methods involved in amplitude modulation system.
CO2	Compare the phase, frequency and pulse modulation techniques.
CO3	Determine the amount of information in a high bit rate transmission.
CO4	Elaborate the multiple access techniques involved in communication.
CO5	Innovate various medium for digital communication.

COURSE CODE : 19IT5331 COURSE NAME : FUNDAMENTALS OF JAVA PROGRAMMING	
CO1	Understand the concepts of OOPs
CO2	Remember the syntax, semantics and classes in Java language
CO3	Understand object inheritance and its use.
CO4	Understand various types of Exception handling and the use of multithreaded programming.
CO5	Understand to build simple Graphical User Interfaces.

COURSE CODE : 19EI5303 COURSE NAME : INDUSTRIAL CHEMICAL PROCESS	
CO1	Apply the gained knowledge on solids and fluids to handle raw materials.
CO2	Explain the various combustion techniques and its advantages
CO3	Identifies the contemporary technologies used for drying, distillation and refrigeration processes in chemical plants.
CO4	Analyze chemical processes and economics involved in the paper, pulp and fertilizer industries.
CO5	Analyze and formulate the relevant mechanism to control of refineries.

COURSE CODE : 21EI5304 COURSE NAME : OPERATING SYSTEMS	
CO1	Understand the basic concepts and structures of operating systems
CO2	Design various Scheduling algorithms and deadlock prevention and avoidance algorithms.
CO3	Contrast various memory management schemes.
CO4	Understand different prototype file systems.
CO5	Demonstrate the distributed operating systems.

SEMESTER VI

COURSE CODE : 21EI6181

COURSE NAME : INDUSTRIAL SAFETY MANAGEMENT (COMMON TO EEE AND EIE)	
CO1	Explain the concepts of Engineering Safety and its acts.
CO2	Understand and apply the various industrial safety standards and regulations.
CO3	Appraise the accident investigation strategies for an industry.
CO4	Summarize the various Safety performance monitoring and apply them.
CO5	Elaborate the various electrical hazards prevention systems and its methods.

COURSE CODE : 21EI6201 COURSE NAME : PROCESS CONTROL	
CO1	Develop a mathematical model for any process control systems.
CO2	Classify the different controller modes and its design methodologies.
CO3	Distinguish the valves, positioner and their operation on environment.
CO4	Choose a proper tuning method for P, I, D controllers and capable to simulate them.
CO5	Implementing conventional control architectures with advanced multi-loop technique with piping and instrumentation diagrams.

COURSE CODE : 21EI6202 COURSE NAME : DISCRETE TIME AND SIGNAL PROCESSING	
CO1	Understand about discrete time signals and systems.
CO2	Demonstrate the use of z transforms for signal processing applications.
CO3	Apply mathematical tools for all DSP techniques.
CO4	Analyse linear digital filters both FIR and IIR using different techniques and their associated structures.
CO5	Illustrate the selection of DSP processors for different applications.

COURSE CODE : 21EI6251 COURSE NAME : EMBEDDED SYSTEMS (COMMON TO EIE AND EEE)	
CO1	Understand The Basic Structure of Embedded Processors.
CO2	Acquire the knowledge in the architecture of Embedded System.
CO3	Articulate the knowledge in operating systems for embedded process.
CO4	Outline RTOS concepts and issues in embedded system design process.
CO5	Demonstrate the design and implementation process of real time products

COURSE CODE : 21EI6001/19EI6001R COURSE NAME : PROCESS CONTROL LABORATORY	
CO1	Infer the effect of different control modes on various processes.
CO2	Design the controller parameters using different tuning process.

CO3	Evaluate the servo and regulator response for various process control systems.
CO4	Analyze and verify the complex multi loop control system characteristics.
CO5	Demonstrate the control system response for servo motor applications.

COURSE CODE : 21EI6002 COURSE NAME : VIRTUAL INSTRUMENTATION LABORATORY	
CO1	Discuss about basic concepts of virtual instrumentation and its programming.
CO2	Generalize the graphical programming knowledge with data flow concept.
CO3	Compose the data acquisition concepts for interfacing real-instrument.
CO4	Transform the circuit simulation concept to the hardware implementation using NI MULTISIM and ELVISmx.
CO5	Evaluate the process control applications with graphical programming environment.

COURSE CODE : 21EI6701 COURSE NAME : INTERNSHIP TRAINING	
CO1	Employ the skills to communicate efficiently and gain management skills related to industry / research organizations.
CO2	Extend the boundaries of knowledge through research and development.
CO3	Discriminate the knowledge and skills acquired at the workplace to their on-campus studies.
CO4	Develop greater clarity about academic and career goals.
CO5	Define and Visualize the impact of engineering solutions to the society.

COURSE CODE : 19HE6071 COURSE NAME : SOFT SKILLS-II	
CO1	Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict.
CO2	Students will Actively participate meetings, Group Discussions / interviews and prepare & deliver presentations
CO3	Students will define professional behavior and suggest standards for appearance, actions and attitude in a Business environment
CO4	Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.
CO5	Students will excel in complex reasoning.

COURSE CODE : 19HE6072

COURSE NAME : INTELLECTUAL PROPERTY RIGHTS (IPR)	
CO1	Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.
CO2	Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.
CO3	Identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing.
CO4	Identify different types of trademarks and procedure for registration
CO5	Recognize the concept of design, geographical indication and procedure for registration

PROFESSIONAL ELECTIVE - II

COURSE CODE : 21EI6301 COURSE NAME : VLSI DESIGN	
CO1	Explain the fabrication of basic CMOS circuit.
CO2	Design combinational logic circuits.
CO3	Demonstrate sequential CMOS logic circuits.
CO4	Build VHDL programming for digital circuits.
CO5	Establish digital system using FPGA.

COURSE CODE : 21EI6302 COURSE NAME : MICRO ELECTRO MECHANICAL SYSTEMS	
CO1	Summarize the concepts of semiconductors and solid mechanics to fabricate MEMS device.
CO2	Analyze the suitable sensors and actuators for various applications.
CO3	Outline the rudiments of micro fabrication techniques.
CO4	Illustrate the design of micro system.
CO5	Implement polymer and optical MEMS in various applications.

COURSE CODE : 21EI6303 COURSE NAME : INDUSTRIAL DATA COMMUNICATION	
CO1	Outline the basics of data networks.
CO2	Appraise about MODBUS and HART protocol in networking
CO3	Understand the importance of FIELD BUS and PROFIBUS in networking.
CO4	Associate appropriate internetworking standards for data transfer.
CO5	Outline various standards and applications of wireless communication.

COURSE CODE : 21EI6304 COURSE NAME : DIGITAL IMAGE PROCESSING	
CO1	Summarize the fundamentals of digital image processing.
CO2	Apply the spatial and multispectral enhancement techniques in an image.

CO3	Construct the segmentation algorithm for restoration of digital image.
CO4	Establish the image compression techniques.
CO5	Assess the image Representation and Recognition techniques.

COURSE CODE : 21EI6305 **COURSE NAME : INTRODUCTION TO SOFT COMPUTING**	
CO1	Understand the concepts of ANN, different features of fuzzy logic and their modelling, control aspects and different hybrid control schemes
CO2	Understand the basics of artificial neural network.
CO3	Remember the modelling and control of neural network
CO4	Remember on modelling and control of fuzzy control schemes.
CO5	Acquire knowledge on hybrid control schemes.

HICET	PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	ELECTRONICS AND INSTRUMENTATION ENGINEERING
PROGRAMME NAME	B.E
REGULATIONS	R2016

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO1	Have strong foundation in basic science and mathematics to formulate, analyze and solve Electronics and Instrumentation problems.
PEO2	Have good knowledge of Instrumentation systems and their applications to design control and safety systems for industrial process.
PEO3	Exhibit professionalism with ethics, communication and team work to satisfy the needs of the society.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

PO 1	**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 modeling 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)

SEMESTER VII

COURSE CODE : 16EI7201 COURSE NAME : COMPUTER CONTROL OF PROCESS	
CO1	Summarize the need of computer in process industry
CO2	Outline about modeling and system identification techniques
CO3	Build digital control algorithm for a direct discrete system
CO4	Design adaptive controller for applications
CO5	Explain the concepts of multivariable regulatory control

COURSE CODE : 16EI7202 COURSE NAME : INDUSTRIAL DATA NETWORKS	
CO1	Outline the basics of data networks.
CO2	Associate appropriate internetworking standards for data transfer.
CO3	Understand the importance of HART and field bus in networking.
CO4	Appraise about MODBUS, PROFIBUS and other communication protocol in networking.
CO5	Outline various standards and applications of wireless communication.

COURSE CODE :16EI7203 COURSE NAME : PROGRAMMABLE LOGIC AND DISTRIBUTED CONTROL SYSTEM	
CO1	Demonstrate the knowledge of programmable logic controllers and programs using ladder diagram.
CO2	Summarise the various fields the Programmable logic controllers can be used.
CO3	Illustrate the characteristics of data acquisition system.
CO4	Illustrate the need for distributed control systems.
CO5	Demonstrate the knowledge of interfaces in distributed control systems and its applications.

COURSE CODE : 16EI7001 COURSE NAME : COMPUTER CONTROL OF PROCESS AND SIMULATION LABORATORY	
CO1	Compare various linear system simulated responses.
CO2	Evaluate the discrete controller parameters using different tuning process.
CO3	Compile various discrete controller algorithms for different systems.

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CO4	Visualize the computer based control system response for various physical processes.
CO5	Demonstrate PLC based control applications and its working in real time.

COURSE CODE : 16EI7002 COURSE NAME : INSTRUMENTATION SYSTEM DESIGN LABORATORY	
CO1	Design various types of filter circuits and amplifiers.
CO2	Suggest a suitable power supply circuit.
CO3	Able to analyse the performance of thermocouple, strain gauge and RTD.
CO4	Plot the performance characteristics of control valve.
CO5	Design a data acquisition system.

COURSE CODE : 16EI7701 COURSE NAME : INTERNSHIP / INDUSTRIAL TRAINING	
CO1	Improve the skills to communicate efficiently and gain management skills related to industry / research organizations. .
CO2	Extend the boundaries of knowledge through research and development.
CO3	Discriminate the knowledge and skills acquired at the workplace to their on-campus studies.
CO4	Develop greater clarity about academic and career goals.
CO5	Visualize the impact of engineering solutions to the society.

PROFESSIONAL ELECTIVE - III

COURSE CODE :16EI7301 COURSE NAME : FIBER OPTICS AND LASER INSTRUMENTATION	
CO1	Apply the basic concepts of optical fibers in applications.
CO2	Demonstrate fibre optic instrumentation system in industrial applications.
CO3	Develop applications based on lasers.
CO4	Validate the industrial applications of lasers
CO5	Establish industrial application of holography and medical applications of lasers

COURSE CODE :16EI7302 COURSE NAME : ADAPTIVE CONTROL AND SYSTEM IDENTIFICATION	
CO1	Represent complex control systems with adaptive control design.
CO2	Design the controller by using STR and gain scheduling adaptive system.
CO3	Estimate the controller parameters for parametric and non-parametric identification schemes.
CO4	Elaborate advanced identification models for non-linear systems.
CO5	Implement adaptive and system identification concept for various application domain.

COURSE CODE : 16EI7303 COURSE NAME : INSTRUMENTATION IN CEMENT AND STEEL INDUSTRIES	
CO1	Infer the manufacturing processes of cement industries.
CO2	Summarize various measurement and analyzers involved in process industries
CO3	Outline the manufacturing processes of steel industries
CO4	Make use of various controls and system involved in steel industries.
CO5	Innovate the steel manufacturing processes with the help of computer control system

COURSE CODE : 16EI7304 COURSE NAME : TELEMETRY AND TELECONTROL	
CO1	Illustrate the different telemetry methods.
CO2	Summarise the operation involved in telemetry
CO3	Identify the techniques used in radio telemetry.
CO4	Correlate satellite and optical fiber communication telemetry
CO5	Demonstrate the use of computers for different telecontrol methods.

PROFESSIONAL ELECTIVE - IV

COURSE CODE : 16EI7305 COURSE NAME : INSTRUMENTATION IN PAPER INDUSTRIES	
CO1	Apply the process learnt in real time application.
CO2	Summarise various properties of paper and it's testing methods.
CO3	Demonstrate the consistency of paper through the learnt methodologies
CO4	Appraise about the quality parameters associated in production of paper
CO5	Point out the appropriate control technique involved in production of paper.

COURSE CODE :16EI7306 COURSE NAME : MICRO ELECTRO MECHANICAL SYSTEMS	
CO1	Summarize the concepts of semiconductors and solid mechanics to fabricate MEMS device.
CO2	Analyze the suitable sensors and actuators for various applications.
CO3	Outline the rudiments of micro fabrication techniques.
CO4	Illustrate the design of micro system.
CO5	Implement MEMS in various applications.

COURSE CODE : 16EI7307 COURSE NAME : NON-LINEAR CONTROL SYSTEM	
CO1	Classify the linear/non-linear system theory and their types.
CO2	Analyse the various non-linear systems with describing functions.

CO3	Appraise the stability for various nonlinear functions using lyapunov method.
CO4	Design the SISO, MIMO system with feedback linearization
CO5	Implement sliding mode control approach to various non-linear applications

COURSE CODE : 16EI7308 COURSE NAME : SENSOR TECHNOLOGY	
CO1	Summarize the fundamental characteristics of sensor.
CO2	Illustrate the physical sensing principles.
CO3	Decide about the sensing materials and technologies used.
CO4	Discuss electronics circuit experiences for interfacing.
CO5	Validate applications of sensors in different specialization

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COURSE OUTCOMES (COs)

SEMESTER VIII

COURSE CODE : 16EI8901 COURSE NAME : PROJECT WORK	
CO1	Implement the skills acquired in the previous semesters to solve complex engineering problems.
CO2	Develop a model / prototype of an idea related to the field of specialization.
CO3	Establish the work individually or in a team to identify, troubleshoot and build products for environmental and societal issues.
CO4	Effective presentation of ideas with clarity.
CO5	Evaluate surveys towards developing a product which helps in life time learning.

PROFESSIONAL ELECTIVE - V

COURSE CODE :16EI8301 COURSE NAME : INSTRUMENTATION SYSTEM DESIGN	
CO1	Apply acquired skill in designing instrument.
CO2	Analyze various design aspects involved in manufacturing instruments.
CO3	Demonstrate printed circuit board.
CO4	Summarize the concepts of designing a control panel
CO5	Illustrate various reliability concepts involved in the design and operation of instruments.

COURSE CODE : 16EI8302 COURSE NAME : MICROCONTROLLER BASED SYSTEM DESIGN	
CO1	Infer the role of fundamental components of 8051 architecture.
CO2	Abstract the programming concepts involved in 8051 microcontroller.
CO3	Outline the fundamental architecture of PIC family controllers.
CO4	Implementing the Interfacing experiences for various peripheral devices.
CO5	Influence of PIC controller on various industrial case studies.

COURSE CODE : 16EI8303 COURSE NAME : ROBOTICS AND AUTOMATION	
CO1	Illustrate the fundamentals of robots
CO2	Apply knowledge on sensors and robotic vision system
CO3	Develop robots with differential motion and control
CO4	Build programs for robots in various applications
CO5	Innovate the robotic applications

COURSE CODE :16EI8304 COURSE NAME : NUCLEAR POWER PLANT INSTRUMENTATION	
CO1	Express the scenario of nuclear power generation at nationwide and worldwide.
CO2	Outline the process involved in nuclear power generation.
CO3	Establish the thermal effects on the performance of nuclear power plants.
CO4	Adapt the appropriate nuclear power plant.
CO5	Highlight the health issues of nuclear radiation and solutions.

PROFESSIONAL ELECTIVE - VI

COURSE CODE : 16EI8305 COURSE NAME : ENVIRONMENTAL INSTRUMENTATION	
CO1	Apply the concepts of environmental laws and standards for a healthy environment
CO2	Illustrate air pollution control systems
CO3	Summarize the effects of noise pollution and solid waste treatment
CO4	Interpret water quality parameters
CO5	Determine different ground water monitoring techniques

COURSE CODE : 16EI8306 COURSE NAME : SAFETY INSTRUMENTATION SYSTEM	
CO1	Summarize the rudiments of safety lifecycle
CO2	Apply suitable instrumentation system for safety management
CO3	Distinguish basic reliability and system reliability engineering
CO4	Recommend a suitable equipment failure mode
CO5	Demonstrate logic solvers for a safety instrumentation system.

COURSE CODE : 16EI8307

COURSE NAME : INSTRUMENTATION SYSTEMS FOR DISASTER MANAGEMENT	
CO1	Associate the basic concepts of disaster management in real life
CO2	Summarize the vulnerability of environmental disaster
CO3	Determine the measures to be taken during environmental disaster
CO4	Predict the consequences of cyclones
CO5	Innovate the technology in disaster management

COURSE CODE : 16EI8308 COURSE NAME : PROFESSIONAL ETHICS IN ENGINEERING	
CO1	Practice engineering ethics and human values for a moral life.
CO2	Develop the codes of conduct for engineers in the society.
CO3	Experiment the safety measures as a responsible engineer
CO4	Interpret the responsibilities, professional rights and moralities for the enhancement of an organization.
CO5	Validate the broad range of contemporary global issues.

OPEN ELECTIVES

COURSE CODE : 19EI6401 COURSE NAME : SMART SENSORS FOR ENGINEERING APPLICATIONS	
CO1	Describe the concept and characteristics involved in sensors and measurements.
CO2	Explain the methods for the measurement of strain and pressure.
CO3	Describe the methods of measurement for motion and radiation
CO4	Identify and select suitable measurement instruments for measuring heat and temperature.
CO5	Elaborate the functions of electronic sensors

COURSE CODE :16EI7402 COURSE NAME : ELECTRICAL ENERGY MANAGEMENT	
CO1	Illustrate the working of different non conventional energy sources.
CO2	Outline the importance of energy conservation and aware of energy conservation act.
CO3	Identify the role and responsibilities of energy manager
CO4	Outline the fundamentals of energy audit
CO5	Implement energy audit for several applications.

HICET

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	MECHNICAL ENGINEERING
PROGRAMME NAME	MECHNICAL ENGINEERING
REGULATIONS	R2019

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO1	Exhibit their sound theoretical, practical skills and knowledge for successful employments, higher studies, research and entrepreneurial assignments.
PEO2	Lifelong learning skills, professional ethics and good communication capabilities along with entrepreneur skills and leadership, so that they can succeed in their life.
PEO3	Become leaders and innovators by devising engineering solutions for social issues and problems, thus caring for the society.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

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 modeling 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.

HICET

COURSE OUTCOMES (COs)

PROGRAM NAME : MECHNICAL ENGINEERING

Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSE CODE : 21HE1101 COURSE NAME : TECHNICAL ENGLISH	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE : 21MA1101 COURSE NAME : CALCULUS AND LINEAR ALGEBRA	
CO1	Apply the concept of differentiation in any curve.
CO2	Identify the maximum and minimum values of surfaces.
CO3	Apply double integrals to compute area of plane curves
CO4	Evaluation of triple integrals to compute volume ofsolids.
CO5	Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies (or Eigen frequencies) of vibration and the shapes of these vibrational modes.

COURSE CODE : 21PH1101 COURSE NAME : APPLIED PHYSICS	
CO1	Illustrate the fundamental properties of matter
CO2	Discuss the Oscillatory motions of particles
CO3	Analyze the wavelength of different colors
CO4	Understand the advanced technology of LASER in the field of Engineering
CO5	Develop the technology of fiber optical communication in engineering field

COURSE CODE : 21CY1101 COURSE NAME : CHEMISTRY FOR ENGINEERS	
CO1	Differentiate hard and soft water and to solve the related problems on water purification and its significance in industries and daily life
CO2	Acquire the basic knowledge of polymers, composites and FRP and their significance.

CO3	Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences to minimize corrosion to improve industrial design.
CO4	Develop knowledge about the renewable energy resources and batteries along with the need of new materials to improve energy storage capabilities
CO5	Identify the structure and characteristics of unknown/new compound with the help of spectroscopy.

COURSE CODE : 21CS1151 **COURSE NAME : PROBLEM SOLVING AND PYTHON PROGRAMMING**	
CO1	Develop algorithmic solutions to simple computational problem
CO2	Read, write, execute by hand simple Python programs
CO3	Analyze the wavelength of different colors.
CO4	Understand the advanced technology of LASER in the field of Engineering.
CO5	Develop the technology of fiber optical communication in engineering field.

COURSE CODE : 21ME1152 **COURSE NAME : ENGINEERING DRAWING**	
CO1	Understand and interpret the engineering drawings in order to visualize the objects and draw the conics and special curves
CO2	Draw the orthogonal projections of straight lines and planes.
CO3	Interpret the projections of simple solid objects in plan and elevation
CO4	Draw the projections of section of solids and development of surfaces of solids.
CO5	Draw the isometric projections and the perspective views of different objects.

COURSE CODE : 21HE1071 **COURSE NAME : LANGUAGE COMPETENCY ENHANCEMENT**	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication
CO3	Introduced to gain information of the professional world.
CO4	Acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills

COURSE CODE : 21HE1072 **COURSE NAME : CAREER GUIDANCE LEVEL I**	
CO1	Enable students to approach learning Aptitude with ease, and understand recruiter expectation.

COURSE CODE : 21HE1073 **COURSE NAME : ENTREPRENEURSHIP & INNOVATION**	
CO1	Understand the nature of business opportunities, resources, and industries in critical and creative aspects.
CO2	Understand the processes by which innovation is fostered,

	managed, and commercialized.
CO3	Remember effectively and efficiently the potential of new business opportunities.
CO4	Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness..
CO5	Develop a business model for a new venture, including revenue. Margins, operations, working capital, and investment.

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	**COURSE OUTCOMES (COs)**

SEMESTER II

COURSE CODE : 19HE2101 **COURSE NAME : BUSINESS ENGLISH FOR ENGINEERS**	
CO1	Introduced to different modes and types of business communication.
CO2	Practiced to face and react to various professional situations efficiently.
CO3	learnt to practice managerial skills
CO4	Familiarized with proper guidance to business writing
CO5	Trained to analyze and respond to different types of communication.

COURSE CODE : 19MA2101 **COURSE NAME : DIFFERENTIAL EQUATIONS AND COMPLEXVARIABLES**	
CO1	Apply few methods to solve different types of first order differential equations.
CO2	Develop sound knowledge of techniques in solving ordinary differential equations.
CO3	Solve Partial Differential Equations using various methods.
CO4	Infer the knowledge of construction of analytic functions and conformal mapping
CO5	Evaluate real and complex integrals over suitable closed paths or contours

COURSE CODE : 19EE2103 **COURSE NAME : BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING**	
CO1	Apply the KVL and KCL in Electrical circuits.
CO2	Explain the constructional features of AC and DC machines
CO3	Develop awareness on the methods for electrical safety, load protection basics.
CO4	Identify electronics components and use of them to design circuits.

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CO5	Develop Combinational and Sequential logic circuits.

COURSE CODE : 19ME2101 **COURSE NAME : ENGINEERING MECHANICS**	
CO1	Define and illustrate the basic concepts of force system.
CO2	Identify the resultant force and couple, support reactions of the beam.
CO3	Calculate the Centre of gravity and moment of inertia of an object.
CO4	Examine the friction force of particles and objects for Impending Motion.
CO5	Determine the Displacement, velocity and acceleration of particles and objects

COURSE CODE : 19PH2151 **COURSE NAME : PHYSICS OF MATERIALS**	
CO1	Understand the purpose of acceptor or donor levels and the band gap of a semiconductor
CO2	Interpret the basic idea behind the process of magnetism and its applications in everyday
CO3	Discuss the behavior of super conducting materials
CO4	Illustrate the types and importance of crystal systems
CO5	Evaluate the production of ultrasonics and its applications in NDT

COURSE CODE : 19CY2151 **COURSE NAME : ENVIRONMENTAL SCIENCES**	
CO1	Develop an understanding of different natural resources including renewable resources.
CO2	Realise the importance of ecosystem and biodiversity for maintaining ecological balance.
CO3	Understand the causes of environmental pollution and hazards due to manmade activities.
CO4	Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues
CO5	Gain knowledge about the importance of women and child education and know about the existing technology to protect environment

COURSE CODE : 21ME2001 **COURSE NAME : ENGINEERING PRACTICES**	
CO1	Fabricate wooden components and pipe connections including plumbing works.
CO2	Fabricate simple weld joints.
CO3	Fabricate different electrical wiring circuits and understand the AC Circuits

COURSE CODE : 21HE2071 **COURSE NAME : LANGUAGE COMPETENCY ENHANCEMENT**	
CO1	Introduced to different modes and types of business communication
CO2	Practiced to face and react to various professional situations efficiently
CO3	learnt to practice managerial skills

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CO4	Familiarized with proper guidance to business writing.
CO5	Trained to analyze and respond to different types of communication

COURSE CODE : 21HE2072 COURSE NAME : CAREER GUIDANCE LEVEL II	
CO1	Enable students to solve questions on Verbal, Logical and Quantitative Aptitude of placement level

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COURSE OUTCOMES (COs)

SEMESTER III

COURSE CODE : 19MA3101 COURSE NAME : FOURIER SERIES AND STATISTICS	
CO1	Understand the mathematical principles of Fourier series which would provide them the ability to formulate and solve some of the physical problems of engineering.
CO2	Apply the concept of application of Fourier series in solving the heat and wave equations.
CO3	Understand the mix proportioning techniques for field applications.
CO4	Understand the concepts of statistical methods for testing the hypothesis.
CO5	Apply design of experiment techniques to solve various engineering problem.

COURSE CODE : 19ME3201 COURSE NAME : MANUFACTURING TECHNOLOGY– I	
CO1	Identify the suitable casting process for the given component
CO2	Identify the suitable welding process and integrate the basic knowledge from material science
CO3	Compare the functions and applications of metal forming process
CO4	Develop basic calculation to fabricate sheet metal components.
CO5	Understand plastic component manufacturing.

COURSE CODE : 19ME3202 COURSE NAME : ENGINEERING THERMODYNAMICS	
CO1	Understand the thermodynamic principles and its applications.
CO2	Quantify the energy conversion in various thermal systems.
CO3	Identify the losses and inefficient components in the thermodynamic system.
CO4	Apply the thermodynamic principles for predicting the properties of steam, gas and gas mixtures.

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CO5	Apply the psychrometric principles for design of air conditioning systems.

COURSE CODE : 19ME3203 **COURSE NAME : ENGINEERING MATERIALS AND METALLURGY**	
CO1	Understand the atomic structure & classification of engineering materials
CO2	Predict the alloy components and its composition variation with respect to temperature changes.
CO3	Select suitable materials and heat treatment methods for various industrial applications.
CO4	Gain knowledge on testing different types of materials and their applications.
CO5	Explain the properties of non-ferrous alloys, polymers and ceramics.

COURSE CODE : 19ME3251 **COURSE NAME : FLUID MECHANICS AND MACHINERY**	
CO1	Apply the properties of fluids and flow characteristics.
CO2	Apply the momentum principle and losses in pipes in solving real life problems
CO3	Perform the Dimensional and Model analysis.
CO4	Design suitable types of pumps for various applications
CO5	Analyze the performance of various hydraulic turbines

COURSE CODE : 19ME3001 **COURSE NAME : 19ME3001 MANUFACTURING TECHNOLOGY LAB – I**	
CO1	Upon completion of this course, the students can be able to use various lathe, drilling and grinding machines to fabricate various operations.

COURSE CODE : 19ME3002 **COURSE NAME : COMPUTER AIDED DRAWING LAB**	
CO1	Apply the software package for drafting and modeling.
CO2	Create 2D Drawing and 3D modeling of Engineering Components.
CO3	Apply basic concepts to develop construction drawing techniques

COURSE CODE : 19MC3191 **COURSE NAME : INDIAN CONSTITUTION**	
CO1	Illustrate the functions of the Indian government
CO2	Illustrate the the rules of the Indian constitution.

COURSE CODE : 19HE3072 **COURSE NAME : CAREER GUIDANCE – LEVEL III**	
CO1	Enable students to approach learning Aptitude with ease, and understand recruiter expectation

COURSE CODE : 19HE3073

COURSE NAME : LEADERSHIP MANAGEMENT SKILLS	
CO1	Practice essential leadership skills in day-to-day operations
CO2	Work on leadership skills in the study environment
CO3	Understand and develop the skills consciously.
CO4	Know about the real worth of all the skills for success
CO5	Analyze the real worth of the person and suggestion for improvement

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COURSE OUTCOMES (COs)

SEMESTER IV

COURSE CODE : 19MA4101 COURSE NAME : NUMERICAL METHODS	
CO1	Solve the system of linear algebraic equations which extends its applications in the field of engineering
CO2	Apply various methods to find the intermediate values for the given data
CO3	Identify various methods to perfrom numerical differentiation and l integration
CO4	Classify and solve ordinary differential equations by using single and multi-step methods.
CO5	Illustrate various methods to find the solution of ordinary and partial differential equations

COURSE CODE : 19ME4201 COURSE NAME : MANUFACTURING TECHNOLOGY – II	
CO1	Understand the concept of metal cutting principles and tool life
CO2	Fabricate engineering components using various lathes and special attachments.
CO3	Conduct experiments on conventional machining processe
CO4	Demonstrate the basic concepts of abrasive process and gear cutting operations.
CO5	Demonstrate the understanding of surface finishing process in the CNC machine tools

COURSE CODE : 19ME4202 COURSE NAME : THERMAL ENGINEERING	
CO1	Understand the process of air standard cycles.
CO2	Demonstrate the operating characteristics of internal combustion engines.
CO3	Apply the thermodynamic laws to various thermal equipments like

	steam nozzles and steam turbines.
CO4	Understand the types of compressors, fans and blowers and its applications.
CO5	Understand the principles of air-conditioning system and estimate the cooling loads.

COURSE CODE : 19ME4203 COURSE NAME: KINEMATICS OF MACHINERY	
CO1	Understand the process of air standard cycles.
CO2	Demonstrate the operating characteristics of internal combustion engines
CO3	Apply the thermodynamic laws to various thermal equipments like steam nozzles and steam turbines.
CO4	Understand the types of compressors, fans and blowers and its applications.
CO5	Understand the principles of air-conditioning system and estimate the cooling loads.

COURSE CODE : 19ME4251 COURSE NAME : STRENGTH OF MATERIALS	
CO1	Apply mathematical knowledge to estimate the deformation behavior of simple structures.
CO2	Calculate shear force and bending moment in different types of beams.
CO3	Determine torsion in shafts and stresses in various types of springs.
CO4	Analyze deflection in various beams.
CO5	Estimate the stresses developed in cylinders and spherical shells.

COURSE CODE : 19ME4001 COURSE NAME : MANUFACTURING TECHNOLOGY LAB - II	
CO1	Demonstrate various machining operations using machine tools
CO2	Fabricate different types of components for industrial applications
CO3	Manufacture tools using cutter grinder.
CO4	Develop CNC part programming for the simple components

COURSE CODE : 19ME4002 COURSE NAME : THERMAL ENGINEERING LAB	
CO1	Demonstrate the principles of spark ignition and compression ignition engines
CO2	Evaluate the various performance parameters of Internal Combustion Engines
CO3	Determine the properties of fuels and lubricating oils.
CO4	Evaluate the performance of air compressors
CO5	Evaluate the performance of centrifugal blower.

COURSE CODE : 19MC4191 COURSE NAME : ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

CO1	Ability to understand the structure of Indian system of life.
CO2	Connect up and explain basics of Indian Traditional knowledge in modern scientific perspective

COURSE CODE : 19HE4072 COURSE NAME : CAREER GUIDANCE – LEVEL IV	
CO1	Enable students to approach learning Aptitude with ease, and understand recruiter expectation

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COURSE OUTCOMES (COs)

SEMESTER V

COURSE CODE : 19ME5201 COURSE NAME : DYNAMICS OF MACHINES	
CO1	Calculate the inertia forces in reciprocating and rotating masses and turning moments in flywheels.
CO2	Balance reciprocating and rotating masses.
CO3	Analyze free vibration systems.
CO4	Determine the frequency of damped forced vibration systems.
CO5	Evaluate the gyroscopic couple and sensitivity of governor.

COURSE CODE : 19ME5202 COURSE NAME : HEAT AND MASS TRANSFER	
CO1	Know about the conduction heat transfer concepts in the engineering applications.
CO2	Understand the convection phenomena.
CO3	Solve problems on heat exchangers and phase change heat transfer.
CO4	Gain knowledge about Black Body and Grey body radiation.
CO5	Understand the basics of mass transfer.

COURSE CODE : 19ME5203 COURSE NAME : DESIGN OF MACHINE ELEMENTS	
CO1	Demonstrate the use of stress analysis, theories of failure and materials in the design of machine components
CO2	Identify proper assumptions with respect to material, factor of safety, static and dynamic loads for various machine components.
CO3	Design shafts based on strength and rigidity and couplings.
CO4	Design springs and considering stresses in flywheel components.
CO5	Design Sliding contact and rolling contact bearings.

COURSE CODE : 19ME5204 COURSE NAME : AUTOMOBILE ENGINEERING	
CO1	Understand the function of various automobile components and engine parts.
CO2	Understand the fuel supply systems and electrical systems in automobiles.
CO3	Understand the working of transmission system and its various elements.
CO4	know the working of suspension, steering and braking systems
CO5	Understand the various alternate fuels that could be used in automobiles.

COURSE CODE : 19ME5251 COURSE NAME : MACHINE DRAWING (T&L)	
CO1	Use limits, fits and tolerances, orthographic-sectional and assembly drawing procedures in real world problems
CO2	Apply sectional view, assembly and orthographic concepts to draw various machine parts.
CO3	Understand the Concept of fasteners and different joints.
CO4	Draw and demonstrate the projections and sectional views of various mechanical elements.
CO5	Construct assembly drawings of mechanical components.

COURSE CODE : 19ME5001 COURSE NAME : DYNAMICS LAB	
CO1	Understand the velocity ratio for various types of gear trains – simple and Compound
CO2	Conduct experiments on vibrating bodies for predicting natural frequency.
CO3	Draw the cam profiles
CO4	Perform experiments on balancing of masses and determine unbalanced force
CO5	Draw characteristic curves for governors and effect of gyroscopic couple..

COURSE CODE : 19ME5002 COURSE NAME : HEAT TRANSFER LAB	
CO1	Apply the various modes of heat transfer in thermal systems.
CO2	Understand the working principle of refrigeration and air conditioning systems.

COURSE CODE : 19HE5071 COURSE NAME : SOFT SKILLS - I	
CO1	Students will have clarity on their career exploration process and to match their skills and interests with a chosen career path.
CO2	Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others
CO3	Students will understand how teamwork can support leadership skills

CO4	Students will be able to make sense of problems, develop strategies to find solutions, and persevere in solving them.
CO5	Students will demonstrate an enhanced ability to draw logical conclusions and implications to solve logical problems.

COURSE CODE : 19HE5072 COURSE NAME : DESIGN THINKING	
CO1	Develop a strong understanding of the Design Process
CO2	Learn to develop and test innovative ideas through a rapid iteration cycle.
CO3	Develop teamwork and leadership skills

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	COURSE OUTCOMES (COs)

SEMESTER VI

COURSE CODE : 19ME6201 COURSE NAME : CAD / CAM	
CO1	Understand the mathematics behind 2D and 3D CAD models.
CO2	Learn, interpret and analyze different types of modeling techniques.
CO3	Prepare CNC programs and understand the CNC systems
CO4	Apply computer aided process planning techniques.
CO5	Obtain knowledge of product data management.

COURSE CODE : 19ME6202 COURSE NAME : METROLOGY & QUALITY CONTROL	
CO1	Understand the basic principles of measurements.
CO2	Acquire the knowledge about linear and angular measuring instruments.
CO3	Gain the detailed information about form measurements.
CO4	Know the advance measurement concepts in metrology.
CO5	Apply the control charts for the process control

COURSE CODE : 19ME6203 COURSE NAME : DESIGN OF TRANSMISSION SYSTEMS	
CO1	Select the appropriate flexible elements in power transmission systems.
CO2	Design spur and helical gear drives employed in transmission systems.
CO3	Design Bevel and Worm gear drives employed in transmission systems.

CO4	Design single and multispeed gear box
CO5	Design clutches and brakes.

COURSE CODE : 19ME6181 **COURSE NAME : PRINCIPLES OF MANAGEMENT**	
CO1	Analyze the challenges independently in the work place.
CO2	Create the types of business for one's new venture.
CO3	Analyze the impact of costing in business decisions.
CO4	Demonstrate the various marketing and selling techniques.
CO5	Apply HR and factory Act principles in business.

COURSE CODE : 19ME6001 **COURSE NAME : CAD / CAM LAB**	
CO1	Develop 2D drawing and 3D models using modeling software
CO2	Understand the CNC control in modern manufacturing system.
CO3	Prepare CNC part programming and manufacture engineering components.

COURSE CODE : 19ME6002 **COURSE NAME : METROLOGY MEASUREMENTS LAB**	
CO1	Understand the calibration of various measuring instruments.
CO2	Analyze the surface characteristics of components.
CO3	Examine the various profiles of the components

COURSE CODE : 19ME6701 **COURSE NAME : INTERNSHIP / INDUSTRIAL TRAINING**	
CO1	Analyze the various functions of multi disciplinary team.
CO2	Create an ability to communicate effectively
CO3	Apply the impact of engineering solution in global, economic, environmental and social contexts..
CO4	Apply an ability to engage in research and to involve in life- long learning.
CO5	Apply knowledge of contemporary issues.

COURSE CODE : 19HE6071 **COURSE NAME : SOFT SKILLS-II**	
CO1	Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict.
CO2	Students will Actively participate meetings, Group Discussions / interviews and prepare & deliver presentations
CO3	Students will define professional behavior and suggest standards for appearance, actions and attitude in a Business environment
CO4	Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.
CO5	Students will excel in complex reasoning.

COURSE CODE : 19HE6072 COURSE NAME : INTELLECTUAL PROPERTY RIGHTS (IPR)	
CO1	Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.
CO2	Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.
CO3	Identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing.
CO4	Identify different types of trademarks and procedure for registration
CO5	Recognize the concept of design, geographical indication and procedure for registration

COURSE CODE : 19ME5301 COURSE NAME : ADVANCED FOUNDRY TECHNOLOGY	
CO1	Understand the use of foundry in manufacturing sector and design of patterns for steel and cast Iron components.
CO2	Understand the concepts of Gates and risers for steel and cast iron components.
CO3	Analyze moulding materials and methods such as green sand ,dry sand, carbon dioxide, Investment casting, Die casting and permanent moulding for steel and cast iron Weighing upto 25kg.
CO4	Gain the knowledge about different types of furnaces
CO5	Understand theoretical knowledge in testing and determine the composition, temperature,sand reclamation, moulding machines for foundry and cast iron components

COURSE CODE : 19ME5302 COURSE NAME : ADVANCED WELDING TECHNOLOGY	
CO1	Gain the Knowledge in advanced welding technology
CO2	Select and operate tools and equipment to support welding and related activities
CO3	Choose and interpret basic blueprints and welding symbols to fabricate components.
CO4	Develop skills in Gas Metal Arc Welding to industry standards.
CO5	Apply Gas Tungsten Arc Welding to industry standards and pass the AWS Aluminum Aerospace Certification.

COURSE CODE : 19ME5303 COURSE NAME : CNC TECHNOLOGY	
CO1	Illustrate the parameters of metal cutting and understand the components of CNC system
CO2	Select the appropriate drives and controls for CNC machines.

CO3	Construct part programming for various machining process.
CO4	Compute operation and maintenance cost of CNC machines..
CO5	Develop Flexible manufacturing cells and systems..

COURSE CODE : 19ME5304 COURSE NAME : UNCONVENTIONAL MACHINING PROCESSES	
CO1	Upon completion of this course Demonstrate different unconventional machining processes.
CO2	Identify the influence of difference process parameters and their applications.
CO3	know the mechanical energy based process.
CO4	Gain knowledge about chemical energy processes.
CO5	Understand thermal energy based manufacturing processes.

COURSE CODE : 19ME5305 COURSE NAME : HYDRAULICS AND PNEUMATIC SYSTEMS	
CO1	Choose hydraulic and pneumatic elements and demonstrate the applicability of fluid power systems for engineering applications.
CO2	Design customized circuits in hydraulics, pneumatics and servo systems for various industrial needs.
CO3	Draw and explain the working of various types of pumps and hydraulic motors and cylinders.
CO4	Explain the fundamentals of pneumatic systems and working of pneumatic components.
CO5	Draw ladder logic diagrams and explain about low cost automation

COURSE CODE : 19ME6301 COURSE NAME : REFRIGERATION AND AIR CONDITIONING	
CO1	Understand the working principle of various refrigeration cycles.
CO2	Identify the system components and its functions.
CO3	Understand the applications of refrigeration and air conditioning systems.
CO4	Calculate cooling load for an air conditioning buildings.
CO5	Design and selection of air conditioning systems

COURSE CODE : 19ME6302 COURSE NAME : ADVANCED I.C. ENGINES	
CO1	Explain the working of Gasoline fuel injection systems and SI engine combustion.
CO2	Explain the working of Diesel fuel injection systems and CI engine combustion
CO3	Identify the sources of pollution formation and its control.
CO4	Select alternative fuel resources and its utilization techniques in IC engines.
CO5	Acquire knowledge on recent trends in IC engines and future power trains systems

COURSE CODE : 19ME6303

COURSE NAME : DESIGN OF HEAT EXCHANGERS	
CO1	Understand the Industrial applications of heat exchangers.
CO2	: Design the process heat exchanger
CO3	Design the cooling towers, condensers, evaporators and solar collectors.
CO4	To perform thermal analysis using LMTD and NTU methods. CO5: To do thermal design including phase change heat transfer
CO5	Design the cooling towers, condensers, evaporators and solar collectors.

COURSE CODE : 19ME6304 COURSE NAME : GAS DYNAMICS AND JET PROPULSION	
CO1	Explain the effect of Mach number on compressibility.
CO2	Understand the compressible flow in nozzles and diffusers
CO3	Solve problems in Fanno and Rayleigh flow for constant area duct.
CO4	Evaluate the kinds of normal shock phenomena while the deviation in flow properties..
CO5	Understand the knowledge about rocket and jet propulsion

COURSE CODE : 19ME6305 COURSE NAME : ENERGY CONSERVATION AND MANAGEMENT	
CO1	Understand and analyze the energy data of industries
CO2	Carryout energy auditing in industries. .
CO3	Evaluate the economical feasibility of energy projects

COURSE CODE : 19ME6401 COURSE NAME : RENEWABLE ENERGY SOURCES	
CO1	Identify the various renewable energy sources and national and international scenario.
CO2	Calculate the performance of solar collectors.
CO3	Explain the working principle of renewable energy power plants and direct energy conversion systems.
CO4	Develop skills in bio energy.
CO5	Implement the energy conversion system

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)**

DEPARTMENT NAME	MECHANICAL ENGINEERING
PROGRAMME NAME	MECHANICAL ENGINEERING
REGULATIONS	R2016

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO1	Exhibit their sound theoretical, practical skills and knowledge for successful employments, higher studies, research and entrepreneurial assignments.
PEO2	Lifelong learning skills, professional ethics and good communication capabilities along with entrepreneur skills and leadership, so that they can succeed in their life.
PEO3	Become leaders and innovators by devising engineering solutions for social issues and problems, thus caring for the society.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

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 modeling 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.

SEMESTER VII

COURSE CODE : 16ME7201 COURSE NAME : ENTREPRENEURSHIP AND BUSINESS CONCEPTS	
CO1	Understand the concepts of entrepreneurship and its importance.
CO2	Understand the traits of an entrepreneur and the sources of his motivation.
CO3	Demonstrate knowledge of various sources of finance and institutions supporting entrepreneurship.
CO4	Understand the components of a business plan.
CO5	Understand the nature of small business and causes of industrial sickness.

COURSE CODE : 16ME7202 COURSE NAME : POWER PLANT ENGINEERING	
CO1	Describe the operation and maintenance of power plant.
CO2	Understand the design, operation and maintenance of Hydro-electric power plant from mechanical engineering perspective.
CO3	Explain the role of mechanical engineers in the design, operation and maintenance of steam and Nuclear power plant.
CO4	Provender the essential of renewable energy.
CO5	Analyze the power plant economics, renovation and moderation of old power plant.

COURSE CODE : 16ME7203 COURSE NAME : PRINCIPLES OF MANAGEMENT	
CO1	Understand the principles and concepts of management.
CO2	Carry out the process of planning and decision making on employment.
CO3	Perform organizing, departmentation, Recruitment and training in various organizations.
CO4	Apply different controlling techniques to control organizational activities.
CO5	Analyze and apply basic knowledge of management tools & techniques and ISO concepts.

COURSE CODE : 16ME7001 COURSE NAME : COMPREHENSION LAB	
CO1	Understand and comprehend any given problem related to mechanical engineering field.
CO2	Apply knowledge to real time industrial solutions.

COURSE CODE : 16ME7901 COURSE NAME : PROJECT PHASE - I	
CO1	To identify a problem in the field of Mechanical Engineering and provide solutions, which are technically, economically and environmentally feasible.
CO2	To train the students in preparing a project reports, presentations to face the reviews and final university viva examinations.

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SEMESTER VIII

COURSE CODE : 16ME8902 COURSE NAME : PROJECT PHASE - II	
CO1	To learn the practical knowledge and skills in the field of Mechanical Engineering.
CO2	To get an experience and confidence level in a particular domain.
CO3	To train the students in preparing a project reports to face the reviews and viva examinations.

COURSE CODE : 16ME7301 COURSE NAME : DESIGN OF JIGS, FIXTURES AND PRESS TOOLS	
CO1	Demonstrate and analyze the types and functions of jigs and fixtures.
CO2	Design, specify and analyze the jigs for various applications.
CO3	Demonstrate and design the fixtures for various applications
CO4	Demonstrate and analyze the press working terminologies of die and strip layout.
CO5	Design, specify and analyze the dies for different applications

COURSE CODE : 16ME7302 COURSE NAME : DESIGN FOR MANUFACTURE AND ASSEMBLY	
CO1	Understand the selection of materials, methods, fit and tolerance concepts to design a product.
CO2	Familiar in the basic concept of design for castings, welding, sheet metal, forging and manufacturing
CO3	Understand the basic procedure of design for assembly and remanufacture.
CO4	Impart knowledge in Techniques to reduce environmental impact.
CO5	Studied the global issues and design for environments

COURSE CODE : 16ME7303

COURSE NAME : TOOL AND DIE DESIGN	
CO1	Identify the importance of work holding device.
CO2	Design jigs and fixtures
CO3	Calculate the required specifications of a press for required operations.
CO4	Design tools and dies for required operations.
CO5	Design, specify and analyze the dies for different applications

COURSE CODE : 16ME7304 COURSE NAME : DESIGN OF MATERIAL HANDLING EQUIPMENTS	
CO1	Gain knowledge on the need, uses and applications of different material handling equipments
CO2	Obtain knowledge on various types of material handling equipments
CO3	Gain knowledge on selection and applications of material handling equipments.
CO4	Understand the design concepts of various hoists..
CO5	Apply knowledge and solve problems on design concepts of conveyors and elevators.

COURSE CODE : 16ME7305 COURSE NAME : INDUSTRIAL ROBOTICS AND EXPERT SYSTEMS	
CO1	Understand the functions of the basic components of a Robot.
CO2	Study the use of various types of End Effectors and Sensors.
CO3	Gain knowledge in Robot Kinematics and Programming.
CO4	Impart knowledge on the use Robot safety issues and economics.
CO5	mpart knowledge in Robot cell design

COURSE CODE : 16ME7306 COURSE NAME : OPERATIONS RESEARCH	
CO1	Understand the optimization techniques under limited resources for the Engineering and business Problems
CO2	Solve the problems on Transportation Models and project Management Network Models.
CO3	Gain knowledge about the inventory management Techniques.
CO4	Understand and solve the numerical on Queuing Models.
CO5	Gain knowledge about various Decision making approaches.

COURSE CODE : 16ME7307 COURSE NAME : INDUSTRIAL ENGINEERING	
CO1	Apply the Industrial Engineering concepts in the industrial environment.
CO2	Manage and implement different concepts involved in methods study and understanding of work
CO3	Describe different aspects of work system design and facilities design pertinent to manufacturing industries.
CO4	Identify various cost accounting and financial management practices widely applied in industries.
CO5	Develop capability in integrating knowledge of design along with other

	aspects of value addition

COURSE CODE : 16ME7308 COURSE NAME : PRODUCTION PLANNING AND CONTROL	
CO1	Prepare the major production planning and control activities.
CO2	Identify qualitative and quantitative forecasting techniques and their influence on production planning and control
CO3	To understand the push and pull philosophies in production planning and compare different methods in production scheduling
CO4	To know the recent trends like manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP).
CO5	To Solve inventory control and planning issues using either deterministic or stochastic modeling.

COURSE CODE : 16ME7309 COURSE NAME : TOTAL QUALITY MANAGEMENT	
CO1	Understand quality concepts and philosophies of TQM.
CO2	Apply TQM principles and concepts of continuous improvement.
CO3	Apply and analyze the quality tools, management tools and statistical fundamentals to improve quality.
CO4	Understand the TQM tools as a means to improve quality
CO5	Remember and understand the ISO quality systems and procedures adopted.

COURSE CODE : 16ME7310 COURSE NAME : EXPERIMENTAL METHODS FOR ENGINEERS	
CO1	Plan the experimentation.
CO2	Selecting appropriate measuring instruments.
CO3	Identify the suitable controls.
CO4	Understanding the working principle of advanced measuring instruments
CO5	Calculate the errors in experiments

COURSE CODE : 16ME8301 COURSE NAME : MAINTENANCE ENGINEERING	
CO1	Understand the maintenance planning functions.
CO2	Identify maintenance policies and types
CO3	Gain knowledge about methods and instruments for CM
CO4	To analyze failure of machine parts
CO5	Implement failure analysis in material handling equipments.

COURSE CODE : 16ME8302 COURSE NAME : INDUSTRIAL SAFETY ENGINEERING	
CO1	Apply the philosophies behind industrial accidents

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CO2	Apply the hierarchical levels in a safety organization
CO3	Understand the concept of industrial process safety
CO4	Understand the safety procedures for human and apply Industries.
CO5	Apply the types of industrial hazards and preventive measures

COURSE CODE : 16ME8303 COURSE NAME : INDUSTRIAL ERGONOMICS	
CO1	Understand basic principles of ergonomics in humanization
CO2	Apply the principles of work capacity and fatigue.
CO3	Describe and apply ergonomics principles to promote safety, health and productivity.
CO4	Recognize the different environmental factors that affect human performance.
CO5	Identify the different work measurement techniques

COURSE CODE : 16ME8304 COURSE NAME : METROLOGY AND NON DESTRUCTIVE TESTING	
CO1	The student shall be able to understand the concept of Laser Metrology and Computer Integrated Machining Machine
CO2	The student shall be able to understand the techniques used in statistical quality control.
CO3	The student shall be able to analysis the materials characteristics through various non-destructive tests
CO4	The student shall be able to understand the knowledge various radiography characteristics and operations
CO5	The student shall be able to understand the knowledge of ultrasonic and Acoustic emission techniques.

COURSE CODE : 16ME8305 COURSE NAME : LOGISTICS AND SUPPLY CHAIN MANAGEMENT	
CO1	Understand the concept of logistics and supply chain management.
CO2	Appreciate the importance of logistics function in overall success of any business and industrial sector.
CO3	Apply world-class best practices in supply chain management.
CO4	Execute Vendor Quality Assurance systems.
CO5	Implement very good customer relationship methods

COURSE CODE : 16ME8306 COURSE NAME : TWO AND THREE WHEELER VEHICLE TECHNOLOGY	
CO1	Demonstrate with the various systems in two and three wheeled vehicles..
CO2	Understand different types of two and three wheelers
CO3	Understand the special parts and their importance and working in two and three wheelers
CO4	Know the maintenance of two and three wheelers.
CO5	Understand the functioning of clutch and gear box.

COURSE CODE : 16ME8307 COURSE NAME : MANUFACTURING OF AUTOMOTIVE COMPONENTS	
CO1	Identify the different parts of the automobile
CO2	Explain the working of various parts like engine, transmission, clutch, Brakes.
CO3	Describe how the steering and the suspension systems operate
CO4	Understand the environmental implications of automobile emissions
CO5	Develop a strong base for understanding future developments in the automobile industry

COURSE CODE : 16ME8308 COURSE NAME : HYBRID VEHICLES	
CO1	Understand the types of HVAC systems.
CO2	Calculate the cooling and heating loads for various air conditioning rooms.
CO3	Design the air conditioning ducts and piping for HVAC systems.
CO4	Select fans and blowers for air conditioning, ventilation and cooling towers.
CO5	Understand the concept of indoor air quality

COURSE CODE : 16ME8309 COURSE NAME : VEHICLE MAINTENANCE	
CO1	Prepare the record of vehicle operation, maintenance, service schedules etc.
CO2	Interpret the maintenance procedures and inspections of various Components along with systems of Automobile engines & chassis.
CO3	Learn the dismantling of engine components, visual inspections and maintenance of various automobile elements
CO4	To impart the knowledge about fuel, cooling and lubricating systems of Automobile.
CO5	Explain the details of maintenance, fault diagnosis including inspections of various electrical components and electrical systems

COURSE CODE : 16ME8310 COURSE NAME : HEATING, VENTILATION AND AIR CONDITIONING SYSTEMS	
CO1	Understand the types of HVAC systems.
CO2	Calculate the cooling and heating loads for various air conditioning rooms.
CO3	Design the air conditioning ducts and piping for HVAC systems.
CO4	Select fans and blowers for air conditioning, ventilation and cooling towers.
CO5	Understand the concept of indoor air quality.

COURSE CODE : 16ME7402

COURSE NAME : RENEWABLE ENERGY SOURCES	
CO1	Identify the various renewable energy sources and national and international scenario.
CO2	Calculate the performance of solar collectors.
CO3	Explain the working principle of renewable energy power plants and direct energy conversion systems.
CO4	Develop skills in bio energy.
CO5	Implement the energy conversion system.

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	MECHATRONICS ENGINEERING
PROGRAMME NAME	B.E
REGULATIONS	R 2019

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO1	Graduates to synergistically integrate Mechanical system, Electrical systems, Computer systems and Information systems to build Mechatronics product
PEO2	Groom up the students with leadership quality, team spirit, effective communication and life skills
PEO3	Prepare the Graduates towards interdisciplinary research, Entrepreneurial skills and higher studies to the local and global needs.
PEO4	Graduates with an rendering services of their ethical and social responsibility

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

PO1	An ability to apply knowledge of mathematics, science, and engineering
PO2	An ability to design and conduct experiments, as well as to analyze and interpret data
PO3	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
PO4	An ability to function on interdisciplinary teams
PO5	An ability to identify, formulate, and solve engineering problems
PO6	An understand the professional and ethical responsibility
PO7	An ability to communicate effectively
PO8	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
PO9	A recognition of the need for, and an ability to engage in life- long learning
PO10	A knowledge of contemporary issues

PO11	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
PO12	An ability to fabricate real time Mechatronics systems and test its worthiness

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COURSE OUTCOMES (COs)

PROGRAM NAME – B.E MECHATRONICS ENGINEERING

Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSE CODE : 21HE1101 COURSE NAME : TECHNICAL ENGLISH	
CO1	Trained to maintain coherence and communicate effectively
CO2	Practiced to create and interpret descriptive communication
CO3	Introduced to gain information of the professional world.
CO4	Acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE : 21MA1102 COURSE NAME : CALCULUS AND LINEAR ALGEBRA	
CO1	Apply the concept of differentiation in any curve.
CO2	Identify the maximum and minimum values of surfaces.
CO3	Apply double integrals to compute area of plane curves.
CO4	Evaluation of triple integrals to compute volume of solids.
CO5	Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies (or Eigen frequencies) of vibration and the shapes of these vibrational modes

COURSE CODE : 21PH1151 COURSE NAME : APPLIED PHYSICS	
CO1	Illustrate the fundamental properties of matter
CO2	Discuss the Oscillatory motions of particles
CO3	Analyze the wavelength of different colors
CO4	Understand the advanced technology of LASER in the field of Engineering
CO5	Develop the technology of fiber optical communication in engineering field

COURSE CODE : 21CY1151 COURSE NAME : CHEMISTRY FOR ENGINEERS	
CO1	Differentiate hard and soft water and to solve the related problems on water purification and its significance in industries and daily life
CO2	Acquire the basic knowledge of polymers, composites and FRP and their significance
CO3	Develop knowledge on the basic principles of electrochemistry and

	understand the causes of corrosion, its consequences to minimize corrosion to improve industrial design.
CO4	Develop knowledge about the renewable energy resources and batteries along with the need of new materials to improve energy storage capabilities
CO5	Identify the structure and characteristics of unknown/ new compound with help of spectroscopy

COURSE CODE : 21CS1151 **COURSE NAME : PYTHON PROGRAMMING AND PRACTICES**	
CO1	Develop algorithmic solutions to simple computational problems
CO2	Read, write, execute by hand simple Python programs
CO3	Structure simple Python programs for solving problems and Decompose a Python program into functions
CO4	Represent compound data using Python lists, tuples, dictionaries
CO5	Read and write data from/to files in Python Programs.

COURSE CODE : 21ME1153 **COURSE NAME : ENGINEERING DRAWING**	
CO1	Understand and interpret the engineering drawings in order to visualize the objects and draw the conics and special curves.
CO2	Draw the orthogonal projections of straight lines and planes.
CO3	Interpret the projections of simple solid objects in plan and elevation.
CO4	Draw the projections of section of solids and development of surfaces of solids.
CO5	Draw the isometric projections and the perspective views of different objects

COURSE CODE : 21HE1071 **COURSE NAME : LANGUAGE COMPETENCY ENHANCEMENT**	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE : 21HE1072 **COURSE NAME : CAREER GUIDANCE LEVEL - I**	
CO1	Enable students to approach learning Aptitude with ease, and understand recruiter expectation

SEMESTER II

COURSE CODE : 21HE2101 COURSE NAME : BUSINESS ENGLISH FOR ENGINEERS	
CO1	Introduced to different modes and types of business communication.
CO2	Practiced to face and react to various professional situations efficiently.
CO3	Learnt to practice managerial skills.
CO4	Familiarized with proper guidance to business writing.
CO5	Trained to analyze and respond to different types of communication.

COURSE CODE : 21MA2101 COURSE NAME : DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLES	
CO1	Apply few methods to solve different types of first order differential equations.
CO2	Develop sound knowledge of techniques in solving ordinary differential equations.
CO3	Solve Partial Differential Equations using various methods.
CO4	Infer the knowledge of construction of analytic functions and conformal mapping. CO5: Evaluate real and complex integrals over suitable closed paths or contours.
CO5	Evaluate real and complex integrals over suitable closed paths or contours.

COURSE CODE : 21ME2101 COURSE NAME : ENGINEERING MECHANICS	
CO1	Define and illustrate the basic concepts of force system.
CO2	Identify the resultant force and couple, support reactions of the beam.
CO3	Calculate the Centre of gravity and moment of inertia of an object.
CO4	Examine the friction force of particles and objects for Impending Motion.
CO5	Determine the Displacement, velocity and acceleration of particles and objects

COURSE CODE : 21PH2151 COURSE NAME : MATERIAL SCIENCE	
CO1	Understand the purpose of acceptor or donor levels and the band gap of a semiconductor
CO2	Interpret the basic idea behind the process of magnetism and its applications in everyday
CO3	Discuss the behavior of super conducting materials
CO4	Illustrate the types and importance of crystal systems
CO5	Evaluate the production of ultrasonics and its applications in NDT

COURSE CODE : 21CY2151 COURSE NAME : ENVIRONMENTAL STUDIES	
CO1	Develop an understanding of different natural resources including renewable resources.
CO2	Realise the importance of ecosystem and biodiversity for maintaining ecological balance.
CO3	Understand the causes of environmental pollution and hazards due to manmade activities.
CO4	Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues.
CO5	Gain knowledge about the importance of women and child education and know about the existing technology to protect environment

COURSE CODE : 21MT2153 COURSE NAME : BASICS OF MECHATRONICS ENGINEERING	
CO1	Apply the KVL and KCL in electrical circuits
CO2	Explain the constructional features of AC and DC machines.
CO3	Identify electronics components and use of them to design circuits.
CO4	Use appropriate electronic devices for measurement.
CO5	Construct block diagram and explain about the actuators functions

COURSE CODE : 21GE2001 COURSE NAME : ENGINEERING PRACTICES LAB	
CO1	Fabricate wooden components and pipe connections including plumbing works.
CO2	Fabricate simple weld joints.
CO3	Fabricate different electrical wiring circuits and understand the AC Circuits.

COURSE CODE : 21HE2701 COURSE NAME : LANGUAGE COMPETENCY ENHANCEMENT COURSE – II	
CO1	Introduced to different modes and types of communication.
CO2	Practiced to face and react to various professional situations efficiently.
CO3	learnt to practice managerial skills.
CO4	Familiarized with proper guidance to writing.
CO5	Trained to analyze and respond to different types of communication

COURSE CODE : 21HE2072 COURSE NAME : CAREER GUIDANCE LEVEL - II	
CO1	Enable students to solve questions on Verbal, Logical and Quantitative Aptitude of placement level

COURSE CODE : 21HE2073 COURSE NAME : ENTREPRENUERSHIP & INNOVATION	
CO1	Understand the nature of business opportunities, resources, and industries in critical and creative aspects
CO2	Understand the processes by which innovation is fostered, managed, and commercialized.
CO3	Remember effectively and efficiently the potential of new business opportunities.
CO4	Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness.
CO5	Develop a business model for a new venture, including revenue. Margins, operations, working capital, and investment.

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COURSE OUTCOMES (COs)

SEMESTER III

COURSE CODE : 19MA3101 COURSE NAME : FOURIER SERIES AND STATISTICS	
CO1	Understand the mathematical principles of Fourier series which would provide them the ability to formulate and solve some of the physical problems of engineering.
CO2	Apply the concept of application of Fourier series in solving the heat and wave equations.
CO3	Understand the mix proportioning techniques for field applications.
CO4	Understand the concepts of statistical methods for testing the hypothesis.
CO5	Apply design of experiment techniques to solve various engineering problem.

COURSE CODE : 19MT3201 COURSE NAME : MECHANICS OF SOLIDS	
CO1	Compute stresses and strain under different load conditions
CO2	Sketch the shear force and bending moment diagrams of different beams
CO3	Analyze the stresses and strains in shafts subjected torsion
CO4	Design standard beams for safe working conditions
CO5	Investigate the mode of failure in pressure vessels

COURSE CODE : 19MT3202 COURSE NAME : INDUSTRIAL MOTOR CONTROL	
CO1	Recognize the control circuit components used in electrical

	wiring
CO2	Apply the control circuits in industrial motor control
CO3	Sketch the control circuits for Starting and Braking Methods
CO4	Analyze the power semi-conductor devices
CO5	Ability to choose the converters and inverters for real time applications

COURSE CODE :19MT3203 COURSE NAME : DIGITAL APPLICATIONS IN MECHATRONICS SYSTEMS	
CO1	Design the logic circuits and to evaluate its function realizations using gates
CO2	Develop combinational circuit systems using flip flops
CO3	Apply the minimization techniques in sequential circuits
CO4	Compare the memory devices and its functions
CO5	Enumerate the applications of digital electronics in various fields

COURSE CODE : 19MT3151 COURSE NAME : PRODUCTION TECHNOLOGY	
CO1	Choose the suitable casting process based on the product requirements
CO2	Justify the most appropriate manufacturing process and material for a given product
CO3	Interpret the different welding processes used in manufacturing
CO4	Design the process parameters for rolling and sheet metal operations
CO5	Perform a variety of finishing operations on manufacturing products

COURSE CODE : 19MT3001 COURSE NAME : COMPUTER AIDED DRAFTING LABORATORY	
CO1	Sketch simple figures with title block using AutoCAD software commands
CO2	Use the software package for drafting
CO3	Create 2D Drawing of Engineering Components
CO4	Apply basic concepts to develop construction drawing techniques
CO5	Design and modeling the given engineering problems

COURSE CODE : 19MT3002 COURSE NAME: INDUSTRIAL MOTOR CONTROL LABORATORY	
CO1	To explain the various types of starters using contactors and relays
CO2	To develop the control circuits for jogging and reversing operations
CO3	To analyze solid state switches
CO4	To develop the firing circuit for SCR CO5:
CO5	To infer the IC555 timer circuits.

COURSE CODE : 19AC3191 COURSE NAME : INDIAN CONSTITUTION	
CO1	Understand the functions of the Indian government
CO2	Understand and abide the rules of the Indian constitution

COURSE CODE : 19HE3072 COURSE NAME : CAREER GUIDANCE LEVEL - II	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays

COURSE CODE : 19HE3073 COURSE NAME: LEADERSHIP MANAGEMENT SKILLS	
CO1	To practice essential leadership skills in day to day operations
CO2	To work on leadership skills in the study environment
CO3	To understand and develop the skills consciously.
CO4	To know about the real worth of all the skills for success
CO5	To Analyze the real worth of the person and suggestion for improvement

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COURSE OUTCOMES (COs)

SEMESTER IV

COURSE CODE : 19MA4101 COURSE NAME : NUMERICAL METHODS	
CO1	Solve the system of linear algebraic equations representing steady state models and non linear equations arising in the field of engineering.
CO2	Apply various methods to find the intermediate values for the given data.
CO3	Identify various methods to perfrom numerical differentiation and l integration
CO4	Classify and solve ordinary differential equations by using single and multi step methods.
CO5	Illustrate various methods to find the solution of ordinary and partial differential equations

COURSE CODE : 19MT4201 COURSE NAME : MICROCOMPUTER SYSTEMS AND MICROCONTROLLER	
CO1	Interpret the configuration and constructional details of 8085 microprocessor
CO2	Implement different microprocessor interfacing techniques
CO3	Apply basic skills for interfacing common devices to microcontroller
CO4	Develop skill in programming for 8051 Microcontroller
CO5	Enumerate various applications interfacing with microcontroller

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COURSE CODE : 19MT4202 COURSE NAME : THERMODYNAMICS AND FLUID ENGINEERING	
CO1	Identify the different concepts in thermodynamics
CO2	Analyze the processes on TV diagrams to solve engineering problems
CO3	Describe the principles of, refrigeration and psychometric relations
CO4	Analyze the properties of fluids
CO5	Interpret the flow of fluid through pipes in series and parallel

COURSE CODE : 19MT4203 COURSE NAME : THEORY OF MACHINES	
CO1	Design single and double slider mechanism
CO2	Sketch different classifications of cam mec
CO3	Solve the kinematics aspects of gears and gear trains
CO4	Interpret the principles of vibration and mechanism for its control
CO5	Analyze the concept of balancing of masses

COURSE CODE : 19MT4251 COURSE NAME : SENSORS AND SIGNAL CONDITIONING	
CO1	Analyze the performance of thermistor and thermocouple
CO2	Classify the capacitive and inductive transducers
CO3	Describe elastic transducer, vacuum and flow measurement
CO4	Apply various electrical and electronic sensors in real time applications
CO5	Analyze the operations of various data acquisition systems

COURSE CODE : 19MT4001 COURSE NAME : ASSEMBLY PROGRAMMING AND INTERFACING LABORATORY	
CO1	Compile programs for 8085 microprocessor and 8051 microcontroller
CO2	Design the interfacing circuits with 8085 microprocessor & 8051 microcontroller
CO3	Develop a ADC and DAC interfacing
CO4	Infer the stepper motor interfacing with microprocessor
CO5	Demonstrate DC motor control using microcontroller

COURSE CODE : 19MT4002 COURSE NAME: SOLID AND FLUID MECHANICS & MACHINERY LABORATORY	
CO1	Evaluate the different types of mechanical properties of engineering materials
CO2	Calculate the different stresses and strain of engineering materials
CO3	Apply the concepts of fluid energy in fluid flow applications
CO4	Calculate the performance characteristics of various pumps CO5:
CO5	Apply the measurement equipments for flow in turbines

COURSE CODE : 19AC4191 COURSE NAME : MANDATORY III : ESSENCE OF INDIAN TRADITIONAL

KNOWLEDGE	
CO1	Ability to understand the structure of Indian system of life.
CO2	Connect up and explain basics of Indian Traditional knowledge in modern scientific perspective.
CO3	Understanding the holistic life style of yoga.
CO4	Understanding the tradition of philosophy.
CO5	Understanding the Indian linguistic and artistic tradition.

COURSE CODE : 19HE4072 COURSE NAME : CARRER GUIDANCE LEVEL- IV	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

COURSE CODE : 19HE4073 COURSE NAME : IDEATION SKILLS	
CO1	Develop a strong understanding and importance of ideation
CO2	Learn about the different kinds of tools for Ideation
CO3	Learn the need and significance of prototyping and its significance

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COURSE OUTCOMES (COs)

SEMESTER V

COURSE CODE : 19MT5201 COURSE NAME : MACHINE DESIGN	
CO1	Analyse the stress, strain and deflection in simple machine elements
CO2	Calculate safety factors of simple structures exposed to static and repeated loads
CO3	Determine the performance requirements in the selection of commercially available machine elements such as shaft, coupling, gears, bearings and springs etc.
CO4	Design and optimize the selection of brakes and clutches for automotive components and machine elements
CO5	Decide an appropriate failure model

COURSE CODE : 19MT5202 COURSE NAME : INDUSTRIAL AUTOMATION AND CONTROL	
CO1	Demonstrate knowledge and understanding of PLC interfacing and programming techniques
CO2	Design and describe the operation of a PLC program
CO3	Choose various Timers and Counters based on real time applications

CO4	Create PLC program to control typical industrial related processes
CO5	Infer and control the Industrial Process using SCADA systems

COURSE CODE : 19MT5203 COURSE NAME : CONTROL OF MECHATRONICS SYSTEMS	
CO1	Interpret different physical, mechanical, electrical system to Construct equivalent models and its Transfer functions.
CO2	Describe the response of different order systems for and error series
CO3	Analyze the stability of the system using different plots
CO4	Solve system equations in state-variable form
CO5	Identify controller concepts used in industry

COURSE CODE : 19MT5251 COURSE NAME : FLUID POWER SYSTEMS	
CO1	Explain the fundamental concepts of fluid power system
CO2	Apply the hydraulic concepts into pumps and valves
CO3	Design hydraulic circuits for different applications
CO4	Apply the knowledge of pneumatic systems and its components
CO5	Manipulate the knowledge in fluid power system maintenance and troubleshooting techniques

COURSE CODE : 19MT5252 COURSE NAME : OBJECT ORIENTED PROGRAMMING	
CO1	Describe the concepts of objects
CO2	Apply the concepts of data, array and structures
CO3	Develop the program using function overloading, operator overloading, virtual functions and polymorphism
CO4	Create an exception handling application using programs
CO5	Develop the program using the concepts of multithread

COURSE CODE : 19MT5001 COURSE NAME: COMPUTER AIDED MACHINE DRAWING LABORATORY	
CO1	Develop 2D, 3D models using modeling software
CO2	Design and model the constructional features in Engineering field
CO3	Apply the design skills in computer aided machine drawing
CO4	Demonstrate the machine drawings in assembly operations
CO5	Design and model the given machine elements

COURSE CODE : 19MT5002 COURSE NAME : INDUSTRIAL AUTOMATION AND CONTROL LABORATORY - I	
CO1	Demonstrate the working knowledge of PLC for a real time process
CO2	Develop the program in PLC Software and interface with different controlled applications
CO3	Develop hard wiring with PLC and field digital I/Os
CO4	Create the ladder logic for industrial applications
CO5	Explain the uses of SCADA

COURSE CODE : 19HE5071 COURSE NAME : SOFT SKILLS- I	
CO1	Students will have clarity on their career exploration process and to match their skills and interests with a chosen career path.
CO2	Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others
CO3	Students will understand how teamwork can support leadership skills
CO4	Students will be able to make sense of problems, develop strategies to find solutions, and persevere in solving them.
CO5	Students will demonstrate an enhanced ability to draw logical conclusions and implications to solve logical problems.

COURSE CODE : 19HE5072 COURSE NAME : DESIGN THINKING	
CO1	Develop a strong understanding of the Design Process
CO2	Learn to develop and test innovative ideas through a rapid iteration cycle.
CO3	Develop teamwork and leadership skills

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COURSE OUTCOMES (COs)

SEMESTER VI

COURSE CODE : 19MT6181 COURSE NAME: TOTAL QUALITY MANAGEMENT	
CO1	Understand quality concepts and philosophies of TQM
CO2	Apply TQM principles and concepts of continuous improvement
CO3	Apply and analyze the quality tools, management tools and statistical fundamentals to improve quality
CO4	Understand the TQM tools as a means to improve quality
CO5	Remember and understand the ISO quality systems and procedures adopted

COURSE CODE : 19MT6201 COURSE NAME : DESIGN OF MECHATRONICS SYSTEMS	
CO1	Design a system, formulate, analyze and solve Mechatronics engineering problems CO2:
CO2	Classify various models of System Modeling
CO3	Describe various elements used in Real Time Interfacing

CO4	Explain the Data Acquisition and Control system through case studies
CO5	Understand the fuzzy logic techniques in the applications of Mechatronics system design

COURSE CODE : 19MT6202 COURSE NAME: CNC TECHNOLOGY	
CO1	Gain knowledge on CNC components and their working
CO2	Interpret the CNC machine structures and tools
CO3	Describe the drives and controls of CNC machines
CO4	Program for various CNC operations using part programming techniques
CO5	Illustrate the control systems of CNC drives and devices

COURSE CODE : 19MT6251 COURSE NAME : VETRONICS	
CO1	Apply the basics of electronics and Emission controls Techniques in Automobiles
CO2	Select proper Ignition and Injection system for an Automobile
CO3	Compile different sensors and actuators used in automobile industries
CO4	Conclude a electronic control unit to be used in an Automobile
CO5	Design and develop the safety system in Automobiles

COURSE CODE : 19MT6001 COURSE NAME: CNC LABORATORY	
CO1	Ability to write manual part programming using G and M code for simple component
CO2	Develop knowledge on machining operation using CNC machines
CO3	Enrich the knowledge and manual and computer assisted part programming
CO4	Generate CNC codes for the given model and simulate it
CO5	Demonstrate CNC part programming and perform machining operations

COURSE CODE : 19MT6002 COURSE NAME : INDUSTRIAL AUTOMATION AND CONTROL LABORATORY - II	
CO1	Develop hard wiring with PLC and field analog I/Os
CO2	Explain the concept of SCADAand their applications
CO3	Apply various controllers in Real Time Applications
CO4	Construct a SCADA monitoring system for industrial automation process
CO5	Explain the concepts of SCADA

COURSE CODE : 19HE6071 COURSE NAME : SOFT SKILL-II

CO1	Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict.
CO2	Students will Actively participate meetings, Group Discussions / interviews and prepare & deliver presentations
CO3	Students will define professional behavior and suggest standards for appearance, actions and attitude in a Business environment
CO4	Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.
CO5	Students will excel in complex reasoning.

COURSE CODE : 19HE6072 COURSE NAME : INTELLECTUAL PROPERTY RIGHTS(IPR)	
CO1	Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.
CO2	Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.
CO3	Identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing.
CO4	Identify different types of trademarks and procedure for registration
CO5	Recognize the concept of design, geographical indication and procedure for registration

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	MECHATRONICS ENGINEERING
PROGRAMME NAME	B.E
REGULATIONS	R2016

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO1	To apply knowledge of mathematics, science and Mechatronics engineering to solve contemporary engineering problems in the field of automation
PEO2	To identify, design, analyze and evolve the Mechatronics system
PEO3	To self motivate towards lifelong learning and entrepreneurship

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

PO1	An ability to apply knowledge of mathematics, science, and engineering
PO2	An ability to design and conduct experiments, as well as to analyze and interpret data
PO3	An ability to design a system, component, or process to meet desired needsn within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
PO4	An ability to function on interdisciplinary teams
PO5	An ability to identify, formulate, and solve engineering problems
PO6	An understand the professional and ethical responsibility
PO7	An ability to communicate effectively
PO8	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
PO9	A recognition of the need for, and an ability to engage in life- long learning
PO10	A knowledge of contemporary issues

PO11	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
PO12	An ability to fabricate real time Mechatronics systems and test its worthiness

SEMESTER VII

COURSE CODE : 16MT7201 COURSE NAME : DESIGN OF MECHATRONICS SYSTEMS	
CO1	Design a system, formulate, analyze and solve mechatronics engineering problems
CO2	Classify various models of system modeling
CO3	Describe various elements used in real time interfacing
CO4	Explain the data acquisition and control system through case studies
CO5	Apply fuzzy logic techniques in the applications of mechatronics system design

COURSE CODE : 16MT7202 COURSE NAME : ROBOTICS AND MACHINE VISION	
CO1	Explain the basic concepts and working of robot.
CO2	Analyze the kinematics of robot motions for a given problem
CO3	Evaluate and construct a robot end effector for specific applications
CO4	Interpret the function of sensors and machine vision system
CO5	Design a robot for real world problems and applications

COURSE CODE : 16MT7001 COURSE NAME : ROBOTICS LABORATORY	
CO1	Choose different types of robots, links and joints for specific tasks
CO2	Demonstrate the robot movements through programming
CO3	Create basic programming in robots
CO4	Design a robot for the given applications
CO5	Develop an inspection system using machine vision system

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COURSE OUTCOMES (COs)

SEMESTER VIII

Upon the successful completion of the course, the students will be able to

SEMESTER V (PROFESSIONAL ELECTIVES I)

COURSE CODE : 19MT5301 COURSE NAME: ENGINEERING METROLOGY AND MEASUREMENTS	
CO1	Analyze the uncertainties in dimensional metrology and use the measurement standards
CO2	Apply geometric tolerances in design of engineering components
CO3	Choose the proper method to find the errors in surface and screw threads
CO4	Measure the complex profile using advanced measurement techniques
CO5	Select the right measuring tool with decided accuracy for a given application

COURSE CODE : 19MT5302 COURSE NAME : NON TRADITIONAL MACHINING TECHNIQUES	
CO1	List the process parameters of different methods
CO2	Operate the advanced electrical machining operation on the given component
CO3	Select the appropriate chemical process based on the product material
CO4	Interpret how a thermal techniques to be carried out
CO5	Analyze and improve manufacturing processes through surface coating

COURSE CODE : 19MT5303 COURSE NAME : AUTOMOBILE SYSTEMS	
CO1	Explain various components in automobiles and also compare petrol and diesel engine
CO2	Describe the working of manual and automatic transmission
CO3	Apply the steering mechanism in developing a new vehicle
CO4	Design and develop prototype of a suspension vehicle system
CO5	Integrate various electrical systems and accessories with vehicle battery

COURSE CODE : 19MT5304 COURSE NAME : OPERATIONAL RESEARCH	
CO1	Formulate and solve linear programming problem for a physical situations like production, distribution of goods and economics.
CO2	Build and solve Transportation Models.
CO3	Perform model formulation for assignment problems
CO4	Understand the inventory control plan and workout stock level.
CO5	Analyze the various replacement models and apply them for arriving at optimal decisions

COURSE CODE : 19MT5305 COURSE NAME: MATERIALS SCIENCES AND APPLICATIONS	
CO1	Identify the properties of different ferrous and nonferrous metals
CO2	Select appropriate materials based on the application
CO3	Choose the suitable heat treatment process for changing the properties of materials
CO4	Explain the properties composite materials
CO5	Identify the production process in different fields of application

SEMESTER VI (PROFESSIONAL ELECTIVES II)

COURSE CODE : 19MT6301 COURSE NAME : EMBEDDED SYSTEM	
CO1	Design the Embedded system using software tools
CO2	Apply ARM processor in various industries
CO3	Discriminate between various Protocols like serial and Parallel networks
CO4	Design an Embedded system using real time operating system
CO5	Implement an interface between Hardware Peripherals, Sensors and Systems

COURSE CODE : 19MT6302 COURSE NAME : DISCRETE EVENT SYSTEM SIMULATION	
CO1	Design the Product s for the given set of applications
CO2	Generate and select suitable Design methods to Design the Product
CO3	Design a Product , component or process to meet desired needs
CO4	Use CAE, CAD and CAM in industrial Product Design
CO5	: Design the Product s for manufacturing and Assembly

COURSE CODE : 19MT6304 COURSE NAME : NON DESTRUCTIVE TESTING TECHNIQUES	
CO1	Describe about the various NDT techniques
CO2	Interpret the various internal defects of the manufacturing product through UltrasonicMethod
CO3	Analysis the different defects propagation through radiography method
CO4	Examine the defects through Thermography and Magnetic Particle Method
CO5	Analyze the crack propagation through Acoustic Emission and Eddy current Testing

COURSE CODE : 19MT6305 COURSE NAME : DISTINCTIVE ELECTRICAL MACHINES	
CO1	Choose the suitable stepper motor for specific industrial Applications
CO2	Apply the different control techniques for Switched Reluctance Motor
CO3	Analyze the speed and torque characteristics of PMBLDC

CO4	Derive the power and torque equations of PMSM
CO5	Use LIM and servo motor for industrial Applications

COUSE CODE :16MT6304 COURSE NAME : NON DESTRUCTIVE TESTING TECHNIQUES	
CO1	Design the products for the given set of applications
CO2	Generate and select suitable design methods to design the product
CO3	Design a product, component or process to meet desired needs
CO4	Use CAE, CAD and CAM in industrial product design
CO5	Design the products for manufacturing and Assembly

COURSE CODE : 16MT6301 COURSE NAME : FLEXIBLE MANUFACTURING SYSTEM	
CO1	Develop a Modern manufacturing system
CO2	Discuss the planning and scheduling methods used in manufacturing systems
CO3	Select suitable components of FMS for given machine cell
CO4	Simulate and Implement FMS in a manufacturing environment
CO5	Develop a Flexible Manufacturing Cell for various fields of application

COURSE CODE : 16MT6302 COURSE NAME: PRINCIPLES OF MANAGEMENT	
CO1	Apply the function of management in an organization
CO2	Develop various planning techniques to apply it in public and private sector enterprises
CO3	Solve the problem faced by the workers due to decentralization
CO4	Illustrate the leadership qualities and to apply motivational techniques
CO5	Enumerate different approaches to management through case studies

COURSE CODE : 16MT6303 COURSE NAME : DIAGNOSTIC TECHNIQUES	
CO1	Recognize the defects and failure analysis
CO2	Discover the types of maintenance used in industries
CO3	Plan and create the maintenance manual, work order, related documentations
CO4	Utilize the computer for maintenance
CO5	Familiarize the condition monitoring types and methods

COUSE CODE :16MT6304 COURSE NAME : PRODUCT DESIGN AND DEVELOPMENT	
CO1	Design the products for the given set of applications
CO2	Generate and select suitable design methods to design the product
CO3	Design a product, component or process to meet desired needs
CO4	Use CAE, CAD and CAM in industrial product design

CO5	Design the products for manufacturing and Assembly

COURSE CODE : 16MT6305 COURSE NAME : DISTINCTIVE ELECTRICAL MACHINES	
CO1	Choose the suitable stepper motor for specific industrial Applications
CO2	Apply the different control techniques for Switched Reluctance Motor
CO3	Analyze the speed and torque characteristics of PMBLDC
CO4	Derive the power and torque equations of PMSM
CO5	Use LIM and servo motor for industrial Applications

COURSE CODE : 16MT6306 COURSE NAME: MEDICAL MECHATRONICS	
CO1	Select modern engineering and information technology tools for engineering practice
CO2	Select different sensors and transducers for biomedical instrumentation
CO3	Describe the signal conditioning circuits used in biomedical engineering
CO4	Identify different measurement techniques used in physiological parameters measurementCO5:
CO5	Analyze the problems in various fields of medical practice

SEMESTER VII (PROFESSIONAL ELECTIVES III)

COURSE CODE : 16MT7301 COURSE NAME : MEMS AND MICROSYSTEMS	
CO1	Analyze scaling laws that are used extensively in the conceptual design of micro devices and systems
CO2	Select suitable micro sensors and actuators
CO3	Summarize various micro system fabrication techniques
CO4	Choose a micromachining technique, such as bulk micromachining and surface micromachining for a specific MEMS process
CO5	Infer recent advancements in the field of MEMS

COURSE CODE : 16MT7302 COURSE NAME : FACTORY AUTOMATION	
CO1	Apply the automation principles in manufacturing systems
CO2	Develop different material handing mechanisms for industries
CO3	Propose the benefits of automated storage systems
CO4	Compare manual assembly lines and automated assembly lines
CO5	Enumerate different assembly operations in industries

COURSE CODE : 16MT7303 COURSE NAME : SIX SIGMA AND LEAN MANUFACTURING

CO1	Apply the different six sigma tools in an organization
CO2	Employ six sigma techniques for solving implementation issues
CO3	Evaluate the concepts of lean manufacturing over conventional manufacturing
CO4	Identify and implement the cellular manufacturing concept for an industry
CO5	Evaluate the 5S principles and setup time reduction for effective implementation of lean manufacturing in an industries

COURSE CODE :16MT7304 COURSE NAME : NON DESTRUCTIVE TESTING	
CO1	Describe about the various NDT techniques
CO2	Interpret the various internal defects of the manufacturing product through ultrasonic method
CO3	Analysis the different defects propagation through radiography method
CO4	Examine the defects through thermography and magnetic particle method
CO5	Analyze the crack propagation through acoustic emission and eddy current testing

COURSE CODE :16MT7305 COURSE NAME : INTELLIGENT MANUFACTURING SYSTEM	
CO1	Describe types of sensor operations in manufacturing system
CO2	Monitoring the parameters of condition in machinery
CO3	Provide an information about the automatic manufacturing system
CO4	Apply various method to solve group technology problems
CO5	Utilize online collaboration tools to work in complex teams

COURSE CODE : 16MT7306 COURSE NAME : ESSENTIALS OF SOFTWARE PROJECT MANAGEMENT	
CO1	Integrate organizational needs to the most effective software development model
CO2	Plan and manage projects at each stage of the software development life cycle
CO3	Analyze between planning modules that address real world management challenges
CO4	Describe various types of risk, risk identifications and planning involved in project management
CO5	Applying skill of working as a team and as a decision maker in an organization

SEMESTER VII (PROFESSIONAL ELECTIVE IV)
COURSE CODE : 16MT7307 COURSE NAME : RAPID PROTOTYPING AND REVERSE

ENGINEERING	
CO1	Differentiate types of Rapid Prototyping Systems and its Applications in various fields.
CO2	Identify the process of Liquid and Solid Based Models.
CO3	Select the process of Powder Based RP system in Model Making.
CO4	Develop a replica of given model by using principles of Reverse Engineering
CO5	Choose the various RPT Tooling and various Rapid Prototyping Applications

COURSE CODE : 16MT7308 COURSE NAME : COMPUTER CONTROL OF MANUFACTURING SYSTEM	
CO1	Express the NC, DNC and CNC classification
CO2	Manipulate the structural details of CNC machine
CO3	Write manual part programming to manufacture the component
CO4	Apply the programming knowledge in automated manufacturing process
CO5	Illustrate the control systems of CNC drives and devices

COURSE CODE : 16MT7309 COURSE NAME : TOTAL QUALITY MANAGEMENT	
CO1	Understand quality concepts and philosophies of TQM
CO2	Apply TQM principles and concepts of continuous improvement
CO3	Apply and analyze the quality tools, management tools and statistical fundamentals to improve quality
CO4	Understand the TQM tools as a means to improve quality
CO5	Remember and understand the ISO quality systems and procedures adopted

COURSE CODE : 16MT7310 COURSE NAME : ENGINEERING ECONOMICS AND COST ANALYSIS	
CO1	Solve engineering economic problems
CO2	Create a team with positive attitude for making a decision to build a new acceptable profit
CO3	Apply strategies in cash flows for the investments in projects
CO4	Implement the knowledge of maintenance analysis of assets
CO5	Choose the method of depreciating fund to recover money from earnings

COURSE CODE : 16MT7311 COURSE NAME : NANO TECHNOLOGY	
CO1	Interpret the basic concepts of nano technology
CO2	Express the knowledge in nano system
CO3	Evaluate the interfaces of nano technology
CO4	Select the suitable nano sensor for different applications

CO5	Design MEMS / NEMS devices for various applications

COURSE CODE : 16MT7312 COURSE NAME: SIGNALS AND SYSTEMS FOR MECHATRONICS	
CO1	Compare continuous time signals and discrete time signals
CO2	Implement convolution techniques in linear time invariant system.
CO3	Examine the properties of fourier series and fourier transform
CO4	Solve Fourier Transform and Z transform in continuous time signal & discrete Time signals
CO5	Develop continuous time signal from its samples using interpolation

SEMESTER VIII (PROFESSIONAL ELECTIVE V)

COURSE CODE : 16MT8301 COURSE NAME : INFORMATION SYSTEM FOR ENGINEERS	
CO1	Describe the basic concepts of information systems
CO2	Create an information system with suitable components
CO3	Familiarize with the database management system of an information systems
CO4	Point out framework for security and control
CO5	Evaluate various modules in ethical and social issues in using information systems

COURSE CODE : 16MT8302 COURSE NAME: INDUSTRIAL IOT	
CO1	Describe about IoT and its applications
CO2	Use of networks, communication and data management in IoT
CO3	Explain security and privacy in IoT
CO4	Develop applications in IoT for industry
CO5	Compare and contrast different interoperability

COURSE CODE : 16MT8303 COURSE NAME : ENTREPRENEURSHIP DEVELOPMENT	
CO1	Apply the knowledge in regard to the process of new technology to the market
CO2	Describe their needs of motivational programs
CO3	Assess the need for innovation, initiate the process and run innovations in organizations
CO4	Manipulate the knowledge in finance and accounting for the development of entrepreneurship
CO5	Evaluate the growth of the enterprises

COURSE CODE : 16MT8304 COURSE NAME : MOBILE ROBOTICS

CO1	Design and modeling of mobile robots
CO2	Model the trajectory path of the robot
CO3	Interpret various sensors used for perception
CO4	Prepare localizing and mapping the robot
CO5	Develop the navigation path of the robot

COURSE CODE : 16MT8305 COURSE NAME : ARTIFICIAL INTELLIGENCE FOR MECHATRONICS ENGINEERING	
CO1	Solve the given problem using back propagation algorithm which is used as a decision support tool
CO2	Identify problems that are amenable to solution by neural networks
CO3	Apply Genetic Algorithm to various optimization problems
CO4	Summarize the concepts of fuzzy system
CO5	Develop the practical skills for understanding complexity and solving dynamic systems that exhibits chaotic behavior

COURSE CODE : 16MT8306 COURSE NAME: MODERN WIRELESS COMMUNICATION SYSTEMS	
CO1	Identify proper transmission channel
CO2	Categorize different communication networks and its accessing techniques
CO3	Combine terminal mobility, personal mobility, and service profile management
CO4	Illustrate the performance of various access technologies
CO5	Plan the features for future phones

SEMESTER VIII (PROFESSIONAL ELECTIVE VI)

COURSE CODE : 16MT8307 COURSE NAME : PROFESSIONAL ETHICS IN ENGINEERING	
CO1	Analyze the components of ethics and values
CO2	Recognize, list and describe ethical issues and professional importance to the engineer.
CO3	Apply function effectively as an individual, as a part of team and in a multi-disciplinary environment.
CO4	Discuss what it means to be human and to live in a community with rights and responsibilities
CO5	Analyze international interconnections and interdependence through global issues

COURSE CODE : 16MT8308 COURSE NAME : NON-CONVENTIONAL ENERGY SOURCES

CO1	Relate the effect of renewable and non-renewable energy sources on climate change and other global contemporary issues
CO2	Describe the technologies that are used to harness the power of solar energy
CO3	Summarize the renewable energy sources such as wind, tidal and geothermal
CO4	Discuss the biogas conversion of biomass for energy application
CO5	Compute performance characteristics of direct energy conversion systems and explain their storage and transport phenomena

COURSE CODE : 16MT8309 COURSE NAME : FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT	
CO1	Analyze various global trends and decide on the scope of a new product
CO2	Develop product management plan for a new product based on the type of the new product and development methodology
CO3	Summarize requirement engineering and know how to collect, analyze and to arrive the requirements for new product development and convert them in to design specification
CO4	Conceptualize new product integrating the hardware, software, controls, electronics and mechanical systems
CO5	Explain the growth of engineering services and product development in industries

COURSE CODE : 16MT8311 COURSE NAME : TEXTILE AUTOMATION	
CO1	Evaluate textile technology and manufacturing with textile fibers
CO2	Describe various process involved in spinning
CO3	List out the various process involved in weaving
CO4	Explain various stages of automation scopes in spinning machinery
CO5	Outline the role of computers in automated weaving machinery

COURSE CODE : 16MT8312 COURSE NAME : MICRO MANUFACTURING	
CO1	Design and development Micro machining set up
CO2	Select a micro manufacturing method and identify key variables to improve quality of Microturning
CO3	Interpret different techniques for the synthesis and characterization of micro materials
CO4	Identify the defects through laser penetration techniques
CO5	Apply their visualization skills in developing new research in micro level products

SEMESTER VI (OPEN ELECTIVE I)

COURSE CODE :16MT6401 COURSE NAME : INDUSTRIAL SAFETY AND ENVIRONMENT	
CO1	Identify the evaluation of industrial safety, Health and Environmental Standards
CO2	Describe the types of accidents and safety measures
CO3	Describe the safety working procedure of different work area
CO4	Apply ergonomics for safety working procedure for humans in industrial area
CO5	Identify the needs of environmental management for Sustainable Development

SEMESTER VII (OPEN ELECTIVE II)

COURSE CODE : 16MT7402 COURSE NAME : ELECTRICAL AND HYBRID VEHICLES	
CO1	Classify electric vehicle and its components
CO2	Calculate the vehicles design considerations
CO3	Develop the ancillary systems and its design
CO4	Compare various energy storage devices and energy sources
CO5	Conclude the performance of the electrical vehicle using modeling

HICET	**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)**

DEPARTMENT NAME	INFORMATION TECHNOLOGY
PROGRAMME NAME	B TECH
REGULATIONS	R 2019

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1	Graduates of the program will be proficient in identifying, formulating and solving complex problems by applying their knowledge of mathematics, science and Information Technology principles.
PEO2	Graduates of the program will be capable of analyzing, designing, Implementing and managing software projects through continuous learning and use modern tools to meet real-world constraints.
PEO3	Graduates of the program exhibits professionalism with ethical attitude, communication, team work and will contribute to society needs.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

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 engineeringsciences.
PO3	**DESIGN/ DEVELOPMENT OF SOLUTIONS:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate considerations for the public health and safety, and the cultural, societal and environmentalconsideration.
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 validconclusions.
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 thelimitations.
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 engineeringpractice.
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 sustainabledevelopment.
PO8	**ETHICS**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineeringpractice.
PO9	**INDIVIDUAL AND TEAM WORK**: Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinarysettings.
PO 10	**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 clearinstructions.
PO 11	**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 multidisciplinaryenvironment.
PO 12	**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 technologicalchange.

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COURSE OUTCOMES (COs)

PROGRAM NAME – B Tech IT

Upon the successful completion of the course, the students will be

SEMESTER I

COURSE CODE : 19HE1101 COURSE NAME : TECHNICAL ENGLISH	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	Acquire various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE : 19MA1101 COURSE NAME : CALCULUS	
CO1	Apply the concept of differentiation in any curve.
CO2	Evaluation of infinite series approximations for problems arising in mathematical modeling
CO3	Identify the maximum and minimum values of surfaces
CO4	Apply double integrals to compute area of plane curves.
CO5	Evaluation of triple integrals to compute volume of solids.

COURSE CODE :19PH1151 COURSE NAME : APPLIED PHYSICS	
CO1	Illustrate the fundamental properties of matter
CO2	Discuss the Oscillatory motions of particles
CO3	Analyze the wavelength of different colors
CO4	Understand the advanced technology of LASER in the field of Engineering
CO5	Develop the technology of fiber optical communication in engineering field

COURSE CODE :19CY1151 COURSE NAME : CHEMISTRY FOR ENGINEERS	
CO1	Differentiate hard and soft water and to solve the related problems on water purification and its significance in industries and daily life
CO2	Acquire the basic knowledge of polymers, composites and FRP and their significance.

CO3	Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences to minimize corrosion to improve industrial design.
CO4	Develop knowledge about the renewable energy resources and batteries along with the need of new materials to improve energy storage capabilities.
CO5	Identify the structure and characteristics of unknown/new compound with the help of spectroscopy.

COURSE CODE : 19CS1151 **COURSE NAME : PYTHON PROGRAMMING AND PRACTICES**	
CO1	Develop algorithmic solutions to simple computational problems
CO2	Read, write, execute by hand simple Python programs
CO3	Structure simple Python programs for solving problems and Decompose a Python program into functions
CO4	Represent compound data using Python lists, tuples, dictionaries
CO5	Read and write data from/to files in Python Programs

COURSE CODE : 19EC1154 **COURSE NAME : ELECTRON DEVICES AND ELECTRIC CIRCUITS**	
CO1	Apply network theorems for AC and DC Circuits.
CO2	Understand the concept of transient response of circuits.
CO3	Ability to explain the theory, construction, and operation of diodes and BJT.
CO4	Ability to explain the theory, construction, and operation of FET and special

COURSE CODE : 21HE1071 **COURSE NAME : LANGUAGE COMPETENCY ENHANCEMENT**	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	Various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE : 21HE1072 **COURSE NAME : CAREER GUIDANCE – LEVEL I**	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	Various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE : 21HE1073 **COURSE NAME : ENTREPRENEURSHIP & INNOVATION**	
CO1	Understand the nature of business opportunities, resources, and industries in critical and creative aspects.

CO2	Understand the processes by which innovation is fostered, managed, and commercialized.
CO3	Remember effectively and efficiently the potential of new business opportunities.
CO4	Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness.
CO5	Develop a business model for a new venture, including revenue. Margins, operations, working capital, and investment.

COURSE CODE : 21CS1152 COURSE NAME : OBJECT ORIENTED PROGRAMMING USING PYTHON	
CO1	Understanding the basic concepts to read, write and execute simple python programs.
CO2	Apply the conditional and looping concepts for solving problems.
CO3	Apply functions to decompose larger complex programs.
CO4	Understanding the OOPS concepts and writing programs using classes and objects.
CO5	Understand to read and write data from/to files in Python Programs.

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COURSE OUTCOMES (COs)

SEMESTER II

COURSE CODE : 19HE2101 COURSE NAME : BUSINESS ENGLISH FOR ENGINEERS	
CO1	Introduced to different modes and types of business communication.
CO2	Practiced to face and react to various professional situations efficiently.
CO3	Learnt to practice managerial skills.
CO4	Familiarized with proper guidance to business writing.
CO5	Trained to analyze and respond to different types of communication

COURSE CODE : 19MA2104 COURSE NAME : DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA	
CO1	Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural
CO2	Infer the knowledge of vector spaces
CO3	Apply few methods to solve different types of first order differential equations.
CO4	Develop sound knowledge of techniques in solving ordinary differential equations.
CO5	Solve Partial Differential Equations using various methods.

COURSE CODE : 19ME2154 COURSE NAME : ENGINEERING GRAPHICS	
CO1	Understand and interpret the engineering drawings in order to visualize the objects and draw the conics and special curves.
CO2	Draw the orthogonal projections of straight lines and planes.
CO3	Interpret the projections of simple solid objects in plan and elevation.
CO4	Draw the projections of section of solids and development of surfaces of solids.
CO5	Draw the isometric projections and the perspective views of different objects.

COURSE CODE : 19PH2151 COURSE NAME : MATERIAL SCIENCE	
CO1	Understand the purpose of acceptor or donor levels and the band gap of a semiconductor
CO2	Interpret the basic idea behind the process of magnetism and its applications in everyday
CO3	Discuss the behavior of super conducting materials
CO4	Illustrate the types and importance of crystal systems
CO5	Evaluate the production of ultra-sonics and its applications in NDT

COURSE CODE : 19CY2151 COURSE NAME : ENVIRONMENTAL STUDIES	
CO1	Develop an understanding of different natural resources including renewable resources.
CO2	Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
CO3	Understand the causes of environmental pollution and hazards due to manmade activities.
CO4	Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues.
CO5	Gain knowledge about the importance of women and child education and know about the existing technology to protect environment

COURSE CODE : 19IT2151 COURSE NAME : PROGRAMMING IN C	
CO1	Select appropriate data types and control structures for solving a given problem.
CO2	Develop applications using arrays and strings
CO3	Understand the importance of functions, pointers and dynamic memory allocation.
CO4	Understand the Concepts of structures to develop applications in C using
CO5	Understand the sequential and random-access file processing and develop applications in C

COURSE CODE : 19ME2001/19EE2001 COURSE NAME : ENGINEERING PRACTICES LABORATORY	
CO1	Fabricate wooden components and pipe connections including plumbing works.
CO2	Fabricate simple weld joints.
CO3	Fabricate different electrical wiring circuits and understand the AC Circuits.

COURSE CODE : 21HE2071 COURSE NAME : LANGUAGE COMPETENCY ENHANCEMENT	
CO1	Introduced to different modes and types of communication.
CO2	Practiced to face and react to various professional situations efficiently.
CO3	Learnt to practice managerial skills.
CO4	Familiarized with proper guidance to writing.
CO5	Trained to analyze and respond to different types of communication

COURSE CODE : 21HE2072 COURSE NAME : CAREER GUIDANCE – LEVEL II	
CO1	Enable students to solve questions on Verbal, Logical and Quantitative Aptitude of placement level

COURSE CODE : 21IT2153 COURSE NAME : RELATIONAL DATABASE MANAGEMENT SYSTEM	
CO1	Describe the fundamental elements of relational database management systems
CO2	Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
CO3	Improve the database design by normalization.
CO4	Design ER-models to represent simple database application scenarios
CO5	Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.

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COURSE OUTCOMES (COs)

SEMESTER III

COURSE CODE : 19IT3201 COURSE NAME : DATA STRUCTURES AND ALGORITHM DESIGN	
CO1	Implement abstract data types for Linear Data Structures.

CO2	Apply the different linear and Non-Linear Data Structures to problem solutions
CO3	Explain the fundamentals of Analysis of Algorithm
CO4	Analyze algorithms and estimate their Best-Case, Worst-Case and Average-case Behavior.
CO5	Explain the concepts of NP Complete problems

COURSE CODE : 19IT3202 COURSE NAME : OBJECT ORIENTED PROGRAMMING USING C++	
CO1	Differentiate between structures of Procedure Oriented Programming and Object-Oriented Programming
CO2	Apply the concepts of Data Abstraction, Encapsulation and Inheritance for problem solutions.
CO3	Understand the concept of Function Overloading, Operator Overloading, Virtual Functions and Polymorphism
CO4	Classify Inheritance with the understanding of early and late binding, usage of Exception Handling
CO5	Use File handling techniques and apply Generic Programming Techniques

COURSE CODE : 19IT3203 COURSE NAME : COMPUTER ORGANIZATION AND ARCHITECTURE	
CO1	Understand the Basic Instructions and Addressing Modes
CO2	Demonstrate and perform Computer arithmetic Operations on Integer and Real numbers.
CO3	Learn the Pipelined concepts and Hazards. To know how to overcome the Hazards
CO4	Compare the parallel processing architectures.
CO5	Exemplify in a better way the I/O and Memory Organization

COURSE CODE : 19IT3251 COURSE NAME : DIGITAL PRINCIPLES AND SYSTEM DESIGN	
CO1	Simplify Boolean functions using different methods.
CO2	Analyse, design and implement combinational logic circuits
CO3	Analyse, design and implement Synchronous sequential logic circuits
CO4	Analyse, design and implement Asynchronous sequential logic circuits
CO5	Simulate and implement combinational and sequential circuits using HDL

COURSE CODE : 19MA3151 COURSE NAME : STATISTICS AND QUEUING THEORY	
CO1	Understand the concepts of random variables.
CO2	Describe various discrete and continuous distribution functions.
CO3	Compute correlation between variables, and predict unknown values using regression along with R studio

CO4	Understand the concepts of statistical methods for testing the hypothesis together with R studio.
CO5	Identify the queuing models in the given system, find the performance measures and analyze the result.

COURSE CODE : 19IT3001 COURSE NAME : DATA STRUCTURES AND ALGORITHMS LABORATORY	
CO1	Demonstrate the various Linear data structures using simple applications.
CO2	Demonstrate the various Non-Linear data structures using simple applications.
CO3	Develop skills to use appropriate Data Structures for solving problems
CO4	To Implement various Sorting and Searching Techniques.
CO5	Implement various Algorithms Design Techniques suitable for different types of problem

COURSE CODE : 19IT3002 COURSE NAME : OBJECT ORIENTED PROGRAMMING USING C++ LABORATORY	
CO1	Able to Understand advanced use of Arrays in C++ programming.
CO2	Able to create Classes and Objects and use them in their program
CO3	Able to Understand the concept of pointers in C++ programming
CO4	Able to identify the exception in program and handle them
CO5	Able to model and implement software solutions with Object Oriented design concept

COURSE CODE : 19MC3191 COURSE NAME : INDIAN CONSTITUTION	
CO1	Understand the functions of the Indian government
CO2	Understand and abide the rules of the Indian constitution

COURSE CODE : 19HE3071 COURSE NAME : CAREER GUIDANCE – LEVEL III	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

COURSE CODE : 19HE3073 COURSE NAME : LEADERSHIP MANAGEMENT SKILLS	
CO1	To practice essential leadership skills in day to day operations
CO2	To work on leadership skills in the study environment
CO3	To understand and develop the skills consciously.
CO4	To know about the real worth of all the skills for success
CO5	To Analyze the real worth of the person and suggestion for improvement

COURSE CODE : 19CS3253 COURSE NAME : CLEAN CODING AND DEVOPS	
CO1	Understand the importance of comments in the applications.
CO2	Understand the data and object antisymmetric
CO3	Understand Cloud computing concepts
CO4	Explain why DevOps on cloud and various DevOps services available on IBM Cloud

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	COURSE OUTCOMES (COs)

SEMESTER IV

COURSE CODE : 19MA4102 COURSE NAME : DISCRETE MATHEMATICS	
CO1	Study the notion of mathematical thinking, proofs, and algorithmic thinking
CO2	Solve problems using counting techniques and recurrence relations
CO3	Infer the knowledge about Lattices and Boolean Algebra.
CO4	Understand the knowledge of formal languages of Compiler Design
CO5	Apply the knowledge of finite automata theory and design discrete problems

COURSE CODE : 19IT4201 COURSE NAME : JAVA PROGRAMMING	
CO1	To Understand the basics of Java Programming.
CO2	Design program using User Defined packages and interfaces
CO3	Develop applications using Multithreading concepts in java
CO4	Design real time applications using Generics and Collection frameworks.
CO5	Apply Event handling classes and Swing concepts to create different applications in java

COURSE CODE : 19IT4202 COURSE NAME : DATABASE MANAGEMENT SYSTEMS	
CO1	Able to design a Data Model.
CO2	Apply ER Diagrams and Normalization concepts for real time applications.
CO3	Apply SQL queries and optimization techniques in real time.

CO4	Apply Transactions and Concurrency mechanisms for real time applications.
CO5	Evaluate the performance of various storage media

COURSE CODE : 19IT4203 COURSE NAME : PRINCIPLES OF OPERATING SYSTEMS	
CO1	Analyse various Scheduling algorithms
CO2	Apply Deadlock, prevention and avoidance algorithms.
CO3	Compare and Contrast various memory management schemes.
CO4	Analyse and implement a prototype File System.
CO5	Study the Linux operating system.

COURSE CODE : 19IT4251 COURSE NAME : OBJECT ORIENTED SOFTWARE ENGINEERING	
CO1	Prepare SRS (Software Requirement Specification) document and SPMP (Software Project Management Plan) document.
CO2	Apply the concept of Functional Oriented and Object-Oriented Approach for Software Design
CO3	Recognize how to ensure the quality of software product, different quality standards and software review techniques
CO4	Apply various Modelling techniques to design the product.
CO5	Able to understand modern Agile Development and Service Oriented Architecture Concept of Industry

COURSE CODE : 19IT4001 COURSE NAME : JAVA PROGRAMMING LABORATORY	
CO1	Understand the basics of Java Programming
CO2	Design program using Inheritance, interface and exception handling techniques
CO3	Develop applications using multithread programming.
CO4	Implement data structure concepts using Generic programs and collection classes
CO5	Design real time applications using Event handling and Swing.

COURSE CODE : 19IT4002 COURSE NAME : DATABASE MANAGEMENT SYSTEMS LABORATORY	
CO1	The student should be able to populate and query a Database
CO2	The student should be able to create different applications using SQL commands
CO3	The student should be able to Create and maintain tables using PL/SQL
CO4	The student should be able to use front end tool
CO5	The student should be able to design and implementation of typical Database applications

COURSE CODE : 19AC4191 COURSE NAME : ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	
CO1	Ability to understand the structure of Indian system of life.
CO2	Connect up and explain basics of Indian Traditional knowledge in modern scientific perspective

COURSE CODE : 19HE4072 COURSE NAME : CAREER GUIDANCE – LEVEL IV	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

COURSE CODE : 19HE4073 COURSE NAME : IDEATION SKILLS	
CO1	Develop a strong understanding and importance of ideation
CO2	Learn about the different kinds of tools for Ideation.
CO3	Learn the need and significance of prototyping and its significance

COURSE CODE : 19CS4204 COURSE NAME : DATA VISUALIZATION	
CO1	Know the history of data visualization and its connection with computer graphics.
CO2	Students understand the foundations and characteristics of data, which forms the beginning of the visualization pipeline.
CO3	Understand the role of user interaction within visualizations, understand the visualization design process.
CO4	Students know some commercial data visualization packages with functionality.

COURSE CODE : 19CS4003 COURSE NAME : DATA VISUALIZATION LABORATORY	
CO1	Know the history of data visualization and its connection with computer graphics
CO2	Students understand the foundations and characteristics of data, which forms the beginning of the visualization pipeline
CO3	Understand the role of user interaction within visualizations, understand the visualization design process
CO4	Students know some commercial data visualization packages with functionality

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COURSE OUTCOMES (COs)

SEMESTER V

COURSE CODE : 19IT5201 COURSE NAME : MOBILE COMPUTING	
CO1	Learn the basic concepts of mobile computing and its applications.
CO2	Execute and Analyse the components of Mobile Operating Systems
CO3	Understand the various schemes in MAC protocols.
CO4	Understand and demonstrate the functionalities of Mobile IP protocols
CO5	Understand the routing and security issues in Ad hoc and Sensor networks

COURSE CODE : 19IT5202 COURSE NAME : COMPUTER NETWORKS	
CO1	Learn about the Protocol Layering and Physical Level Communication
CO2	Understand the Data Communication System and the purpose of Layered Architecture.
CO3	Analyze the concepts of Routing Methods and Subnetting.
CO4	Design protocols for various functions in the Network.
CO5	Understand the functions and Protocols of the Transport Layer

COURSE CODE : 19IT5203 COURSE NAME : MICROCONTROLLERS AND EMBEDDED SYSTEMS	
CO1	Learn the basic Structure of Microcontroller
CO2	Analysis and Design to Interface Program Microcontroller.
CO3	Describe the Function of ARM Processor Architecture
CO4	Understand Memory System Mechanisms.
CO5	Design Conceptual Embedded System.

COURSE CODE : 19IT5204 COURSE NAME : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	
CO1	Identify problems that are amenable to solution by AI methods.
CO2	Identify appropriate AI methods to solve a given problem
CO3	Differentiate between supervised, unsupervised, semi-supervised machine learning approaches
CO4	Analyse and suggest appropriate machine learning approaches for various types of problems
CO5	Design and carry out case studies of Expert Systems.

COURSE CODE : 19IT5205 COURSE NAME : DATA WAREHOUSING AND DATA MINING	
CO1	Identify the Concept of Data Warehousing And OLAP.
CO2	Implement Data Pre-processing For Mining Applications
CO3	Use Data Mining in Business Applications.
CO4	Apply the Association Rules and Classification for Mining the Data.
CO5	Deploy Appropriate Clustering Techniques.

COURSE CODE : 19IT5001 COURSE NAME : MACHINE LEARNING LABORATORY	
CO1	Understand the implementation procedures for the Machine Learning Algorithms
CO2	Design Java/Python programs for various Learning Algorithms
CO3	Apply appropriate data sets to the Machine Learning Algorithms.
CO4	Identify and apply Machine Learning Algorithms to solve real world problems.
CO5	Understand how to perform evaluation of Learning Algorithms and model selection

COURSE CODE : 19IT5002 COURSE NAME : MOBILE APPLICATION DEVELOPMENT LABORATORY	
CO1	Design and Implement various Mobile Applications using Emulators
CO2	Deploy Applications to Hand-Held Devices.

COURSE CODE : 19HE5071 COURSE NAME : SOFT SKILL-I	
CO1	Students will have clarity on their career exploration process and to match their skillsand interests with a chosen career path.
CO2	Students will develop knowledge, skills, and judgment around human communication thatfacilitate their ability to work collaboratively with others
CO3	Students will understand how teamwork can support leadership skills
CO4	Students will be able to make sense of problems, develop strategies to find solutions, andpersevere in solving them
CO5	Students will demonstrate an enhanced ability to draw logical conclusions and implicationsto solve logical problems

COURSE CODE : 19HE5072 COURSE NAME : DESIGN THINKING	
CO1	Develop a strong understanding of the Design Process
CO2	Learn to develop and test innovative ideas through a rapid iteration cycle.
CO3	Develop teamwork and leadership skills

COURSE CODE : 19IT5351 COURSE NAME : INTERNET AND WEB TECHNOLOGY	
CO1	Understand the complexity of the real-world objects
CO2	Learn the best practices for designing Web forms and Usability Reviews

CO3	Understand the Principles behind the design and construction of Web applications
CO4	Build interactive web applications
CO5	Develop and Deploy an Enterprise Application

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COURSE OUTCOMES (COs)

SEMESTER VI

COURSE CODE : 19IT6181 **COURSE NAME : SOFTWARE PROJECT MANAGEMENT**	
CO1	Construct and Realize Software Design or Software Deployment.
CO2	Develop a Budget, Schedule or Work Plan
CO3	Apply Cost Monitoring and Control Strategies for Software Projects
CO4	Understand the Interdependencies between the Processes of the System
CO5	Manage the Organizational Behaviour of People Working in Teams.

COURSE CODE : 19IT6201 **COURSE NAME : INTERNET OF THINGS**	
CO1	Explain the Characteristics and Enabling Technologies of IoT
CO2	Analyse the various Application Protocols related to IoT
CO3	Design IoT based simple applications using Python
CO4	Describe the different Packages, Frameworks and Cloud Services.
CO5	Implement small IoT based Real Time applications

COURSE CODE : 19IT6202 **COURSE NAME : PRINCIPLES OF COMPILER DESIGN**	
CO1	Understand the different phases and lexical Analysis of compiler.
CO2	Apply different parsing algorithms to develop the parsers for a given grammar.
CO3	Understand syntax-directed translation in Intermediate code generation.
CO4	Gain knowledge on Run-time environment.
CO5	Apply code optimization techniques and understand code generation.

COURSE CODE : 19IT6251 **COURSE NAME : CRYPTOGRAPHY AND NETWORK SECURITY**	
CO1	To Classify the Symmetric Encryption Techniques
CO2	To be able Understand Symmetric and Asymmetric Ciphers key algorithm
CO3	To Evaluate security mechanisms, hash functions and digital signature.

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CO4	Summarize the intrusion detection and its solutions to overcome the attacks
CO5	The student will able to apply Network and Internet security protocols

COURSE CODE : 19IT6001 COURSE NAME : INTERNET OF THINGS LABORATORY	
CO1	Understand constraints and opportunities of wireless and mobile networks for Internet of Things
CO2	Analyse real time data stored in a cloud server using data analytics tool
CO3	Develop skills to integrate IoT devices
CO4	Design and implement solutions to IoT based problems.
CO5	Create an IoT based application

COURSE CODE : 19IT6002 COURSE NAME : HARDWARE AND SOFTWARE CLINIC	
CO1	To make the students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.
CO2	To learn everything from equations to probability with a completely different approach.
CO3	To make the students learn on an increased ability to explain the problem comprehensively.

COURSE CODE : 19HE6071 COURSE NAME : SOFT SKILL-II	
CO1	Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict.
CO2	Students will Actively participate meetings, Group Discussions / interviews and prepare &deliver presentations.
CO3	Students will define professional behavior and suggest standards for appearance, actions and attitude in a Business environment.
CO4	Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.
CO5	Students will excel in complex reasoning.

COURSE CODE : 19HE6072 COURSE NAME : INTELLECTUAL PROPERTY RIGHTS (IPR)	
CO1	Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.
CO2	Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.
CO3	Identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing.

CO4	Identify different types of trademarks and procedure for registration
CO5	Recognize the concept of design, geographical indication and procedure for registration

COURSE CODE : 19IT6302 **COURSE NAME : INFORMATION SECURITY**	
CO1	Understand the principal concepts, major issues, technologies and basic approaches in Information Security
CO2	Familiar with the Legal, Ethical and Professional issues in Information Security
CO3	Learn the process of Identifying, Assessing and treating Risks.
CO4	Understand various Security Standards in this area and focus on VISA Security Model.
CO5	Understand the Technological aspects of Information Security

COURSE CODE : 19IT6401 **COURSE NAME : MOBILE APPLICATION DEVELOPMENT**	
CO1	Familiarize with Mobile Apps Development Aspects
CO2	Design Mobile Apps, Using Android as Development Platform, with key focus on User Experience Design.
CO3	Develop Mobile Apps, with key focus on Native Data Handling, Background Tasks and Notifications
CO4	Perform, Testing, Signing, Packaging and Distribution of Mobile Apps
CO5	Deploy Mobile Applications in Android and iPhone Marketplace for Distribution.

HICET	PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	INFORMATION TECHNOLOGY
PROGRAMME NAME	B TECH
REGULATIONS	R 2016

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1	Graduates of the program will be proficient in identifying, formulating and solving complex problems by applying their knowledge of mathematics, science and Information Technology principles.
PEO2	Graduates of the program will be capable of analyzing, designing, Implementing and managing software projects through continuous learning and use modern tools to meet real-world constraints.
PEO3	Graduates of the program exhibits professionalism with ethical attitude, communication, team work and will contribute to society needs.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

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 engineeringsciences.
PO3	**DESIGN/ DEVELOPMENT OF SOLUTIONS:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate considerations for the public health and safety, and the cultural, societal and environmentalconsideration.
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 validconclusions.
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 thelimitations.
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 engineeringpractice.
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 sustainabledevelopment.
PO8	**ETHICS**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineeringpractice.
PO9	**INDIVIDUAL AND TEAM WORK**: Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinarysettings.
PO 10	**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 clearinstructions.
PO 11	**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 multidisciplinaryenvironment.
PO 12	**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 technologicalchange.

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COURSE OUTCOMES (COs)

SEMESTER VII

COURSE CODE : 16IT7201 COURSE NAME : DATA ANALYTICS	
CO1	Explore the big data landscape and analytics
CO2	Work on MapReduce framework and Hive
CO3	Implement CRUD operations using MongoDB and Cassandra
CO4	CO4: Work in data analytics and visualizations.
CO5	Gain Knowledge about R programming basics

COURSE CODE : 16IT7202 COURSE NAME : DISTRIBUTED AND CLOUD COMPUTING	
CO1	Understand distributed communication
CO2	Design distributed resource management
CO3	Familiar with basics of cloud computing
CO4	Design virtualization
CO5	Understand cloud securities and standards

COURSE CODE : 16IT7203 COURSE NAME : INTERNET OF THINGS	
CO1	Understand the characteristics, physical design and enabling technologies of IOT
CO2	Understand protocol standardization and web based protocols related to IOT
CO3	Analyze the logical design and Apply in simple IOT based applications using Python
CO4	Understand Raspberry Pi interfaces and Apply in cloud and Web Services
CO5	Apply the IOT concept in real time applications

COURSE CODE : 16IT7312 COURSE NAME : SOFTWARE PROJECT MANAGEMENT	
CO1	Remember and understand the basics of software project management and methods of software design or software deployment.
CO2	Understand the various allocation techniques and evaluate the cost of the project.
CO3	Apply the scheduling activities of software project and understand the risk evaluation techniques.
CO4	Understand the cost monitoring and control strategies for software

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	projects
CO5	Remember and analyze the organizational behavior of people working in teams.

COURSE CODE : 16IT7303 **COURSE NAME : COMPUTER HARDWARE AND PERIPHERALS**	
CO1	Understand the CPU essentials and memory concepts
CO2	Apply the various Input and output video peripherals and test the performance on PC workstation
CO3	Understand the various storage devices standards and distinguish its performance
CO4	Understand and remember the PC hardware organization and interfacing with peripheral Devices
CO5	Infer the PC troubleshooting

COURSE CODE : 16IT7001 **COURSE NAME : APPLICATION DEVELOPMENT LABORATORY**	
CO1	Understand the constraints and opportunities of wireless and mobile sensors for Internet of Things.
CO2	Analyze real time data stored in a cloud server using data analytics tool.
CO3	Apply the techniques to integrate IOT devices
CO4	Understand the architecture of IOT and Apply the solutions to IOT based problems.
CO5	Develop simple IOT based application

COURSE CODE : 16IT7002 **COURSE NAME : CLOUD COMPUTING LABORATORY**	
CO1	Understand the Basic concept of cloud environment and learn about the recent cloud technologies
CO2	Understand virtual machine design and implement applications on the virtual Cloud Environment
CO3	Apply virtualization concepts for various applications using VirtualBox and Eucalyptus tool.
CO4	Apply Hadoop open-source framework to process big data in a distributed environment
CO5	Understand the concept of Cloud Sim simulator and run various applications on it

COURSE CODE : 16IT7901 **COURSE NAME : PROJECT WORK – PHASE I**	
CO1	Analyze a complex problem and able to reach substantiated solutions
CO2	Develop practical skills needed to understand and modify problems related to programming and designing.
CO3	Execute work as teams on multidisciplinary projects and validate with technical knowledge.



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COURSE OUTCOMES (COs)

SEMESTER VIII

COURSE CODE : 16IT8303 COURSE NAME : ADVANCED DATABASE TECHNOLOGY	
CO1	Understand the basics of Distributed and Parallel Databases Architectures.
CO2	Understand and apply Object Oriented concept into the Relational Databases.
CO3	Apply XML Databases to create Web pages.
CO4	Understand the concepts of Data Mining and Data warehousing.
CO5	Understand the Applications of Advanced Databases to solve real world problems.

COURSE CODE : 16IT8309 COURSE NAME : INFORMATION STORAGE AND RETRIEVAL	
CO1	Understand the fundamental concepts of Information Retrieval
CO2	Apply the concept of information retrieval models to process the information
CO3	Understand an open source search engine framework and explore its capabilities
CO4	Apply suitable mining algorithms to classify the information
CO5	Design a smart information management system for Information Extraction.

COURSE CODE : 16IT8902 COURSE NAME : PROJECT WORK – PHASE II	
CO1	Formulate a real world problem, identify the requirement and develop the design solutions
CO2	Identify technical ideas, strategies and methodologies
CO3	Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project. Test and validate through conformance of the developed prototype and analysis the cost effectiveness.
CO4	Prepare report and present the oral demonstrations

COURSE CODE : 19IT5351R COURSE NAME : INTERNET AND WEB TECHNOLOGY	
CO1	Design simple web pages using mark-up languages like HTML.
CO2	Develop a web page HTML and CSS
CO3	Creation of dynamic web page using Client Side Scripting
CO4	Design a Server Side web application using servlet and JSP
CO5	Creation of simple web application using node.js Framework

COURSE CODE : 19IT5352 COURSE NAME : ADVANCED JAVA PROGRAMMING	
CO1	Design program using user defined Packages and Interfaces.
CO2	Interpret the need for advanced Java concepts like Enumerations and Collections in developing.
CO3	Execute programs on basic concepts of JSP and Build Applications using JSP and deploy the Project using Tomcat Server.
CO4	Work on concepts of Spring.
CO5	Illustrate Database access and details for managing information using the JDBC API

COURSE CODE : 19IT5353 COURSE NAME : C# AND NET PROGRAMMING	
CO1	Understand the Basic Terminologies of C# Languages
CO2	Express the advanced features of C#.
CO3	Enhance the skills on Developing Client Server Applications
CO4	Discover the ideas on Database Applications Development.
CO5	Exhibit Web Applications using ASP.Net

COURSE CODE : 19IT5354 COURSE NAME : ADVANCED DATA STRUCTURE	
CO1	Ability to select the Data Structures that efficiently model the Information in a problem.
CO2	Ability to assess efficiency trade-offs among different Data Structure implementations or combinations.
CO3	Implement and know the various Graph Traversal Methods.
CO4	Implement and know the application of algorithms for Sorting and Pattern Matching.
CO5	Design programs using a variety of data structures, including Hash tables, Binary and general Tree Structures, Search Trees, Tries, Heaps, Graphs, and AVL-trees.

COURSE CODE : 19IT5355 COURSE NAME : ADVANCED DATABASE TECHNOLOGY	
CO1	To understand the Design Fundamentals and Methodologies of the Software
CO2	To provide basic concepts of Software Design Principles
CO3	To understand the Architecture Design and Quality Attributes of the Software.
CO4	To learn the tools of Architectural Design for the current trends
CO5	To Gain practical experience in the Architectural Design Process for learning- oriented software

COURSE CODE : 19IT5356 COURSE NAME : ETHICAL HACKING	
CO1	Understand the basic of Ethical Hacking

CO2	Gain the knowledge about Foot Printing
CO3	Express fundamentals of Data Security
CO4	Understand about the Network Protection System
CO5	Know about Ethical Hacking Laws and Tests

COURSE CODE : 19IT6301 COURSE NAME : BUSINESS INTELLIGENCE AND ANALYSIS	
CO1	Demonstrate knowledge about and understanding of organizational and individual decision- making and future trends of BI.
CO2	Implement the concept of big data and analytics, data visualization techniques.
CO3	Demonstrate the ability to use BI systems and technology to design and build BI applications based on users_ needs
CO4	Apply relevant theories, concepts and techniques to solve real-world BI problems
CO5	Critically evaluate the limitations and possibilities of BI technology

COURSE CODE : 19IT6302 COURSE NAME : INFORMATION SECURITY	
CO1	Understand the principal concepts, major issues, technologies and basic approaches in Information Security.
CO2	Familiar with the Legal, Ethical and Professional issues in Information Security
CO3	Learn the process of Identifying, Assessing and treating Risks.
CO4	Understand various Security Standards in this area and focus on VISA Security Model.
CO5	Understand the Technological aspects of Information Security

COURSE CODE : 19IT6303 COURSE NAME : SOFTWARE DESIGN	
CO1	Design the Software using Designs Fundamentals and Methodologies.
CO2	To create a Good Software by using the Styles, Architectural Design Space.
CO3	To reconstruct the Software Architecture that can be used for an Application of your choice.
CO4	Analyze Specifications and Identify appropriate Design Strategies.
CO5	Develop an appropriate Design for a given set of Requirements.

COURSE CODE : 19IT6304 COURSE NAME : NATURAL LANGUAGE PROCESSING	
CO1	Able to understand the basics of NLP
CO2	Analyse the Natural Language Text.
CO3	Understand Semantic Analysis and Discourse Processing
CO4	Generate the Natural Language and do Machine Translation.
CO5	Apply Information Retrieval Techniques
COURSE CODE : 19IT6305 COURSE NAME : SOFT COMPUTING	

CO1	Apply various Soft Computing Frameworks.
CO2	Design of various Neural Networks.
CO3	Use Fuzzy Logic for Real Time Applications
CO4	Discuss Genetic Programming.
CO5	Assess Hybrid Soft Computing techniques

COURSE CODE : 19IT6307 COURSE NAME : VIRTUAL REALITY AND AUGMENTED REALITY	
CO1	Apply various Soft Computing Frameworks.
CO2	Design of various Neural Networks.
CO3	Use Fuzzy Logic for Real Time Applications
CO4	Discuss Genetic Programming.
CO5	Assess Hybrid Soft Computing techniques

COURSE CODE : 19IT6402 COURSE NAME : MACHINE LEARNING FOR ENGINEERS	
CO1	Apply various Soft Computing Frameworks.
CO2	Design of various Neural Networks.
CO3	Use Fuzzy Logic for Real Time Applications
CO4	Discuss Genetic Programming.
CO5	Assess Hybrid Soft Computing techniques

PROFESISONAL ELECTIVES

COURSE CODE : 16IT7301 COURSE NAME : MULTIMEDIA DESIGN AND STORAGE	
CO1	Apply various Soft Computing Frameworks.
CO2	Design of various Neural Networks.
CO3	Use Fuzzy Logic for Real Time Applications
CO4	Discuss Genetic Programming.
CO5	Assess Hybrid Soft Computing techniques

COURSE CODE : 16IT7302 COURSE NAME : KNOWLEDGE BASED DECISION SUPPORT SYSTEM	
CO1	Apply the basic skills and concepts of various decision support models in business and logistics environments
CO2	Recognize scenario articulation values, strategy formulation and implementation;
CO3	Solve logistics problems using tools and methodologies associated with decision support theories and applications.
CO4	Development of the Artificial Intelligence and business intelligence Technical
CO5	Implementation of Electronic Commerce

COURSE CODE : 16IT7302 COURSE NAME : KNOWLEDGE BASED DECISION SUPPORT SYSTEM

CO1	Apply the basic skills and concepts of various decision support models in business and logistics environments
CO2	Recognize scenario articulation values, strategy formulation and implementation;
CO3	Solve logistics problems using tools and methodologies associated with decision support theories and applications.
CO4	Development of the Artificial Intelligence and business intelligence Technical
CO5	Implementation of Electronic Commerce

COURSE CODE : 16IT7303 COURSE NAME : COMPUTER HARDWARE AND PERIPHERALS	
CO1	Memorize the CPU essentials and memory concepts..
CO2	Demonstrate the various Input and output video peripherals test the performance on PC workstation.
CO3	Identify the various storage devices standards and distinguish its performance
CO4	Summarize the PC hardware organization and interfacing with peripheral Devices.
CO5	Infer the PC troubleshooting

COURSE CODE : 16IT7304 COURSE NAME : WIRELESS SECURITY	
CO1	Familiarize with the issues and technologies involved in designing a wireless and mobile system that is robust against various attacks.
CO2	Gain knowledge and understanding of the various ways in which wireless networks can be attacked and tradeoffs in protecting networks.
CO3	Have a broad knowledge of the state-of-the-art and open problems in wireless and mobile security, thus enhancing their potential to do research or pursue a career in this rapidly developing area.
CO4	Learn various security issues involved in cloud computing
CO5	Learn various security issues related to GPRS and 3G

COURSE CODE : 16IT7305 COURSE NAME : SOCIAL NETWORK ANALYSIS	
CO1	Develop semantic web related applications.
CO2	Represent knowledge using ontology.
CO3	Predict human behavior in social web and related communities.
CO4	Visualize social networks
CO5	Understand Real time applications of social network analysis.

COURSE CODE : 16IT7306 COURSE NAME : SERVICE ORIENTED ARCHITECTURE	
CO1	Build applications based on XML.
CO2	Apply the key principles of SOA
CO3	Develop web services using technology elements.

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CO4	Build SOA-based applications for intra-enterprise and inter-enterprise applications.
CO5	Apply security models in web services

COURSE CODE : 16IT7307 COURSE NAME : DIGITAL IMAGE PROCESSING	
CO1	Acquire the knowledge on fundamentals of Digital image processing and tools used.
CO2	Acquire the knowledge about filtering, transforms, morphology, image analysis and compression.
CO3	Apply and implement frequency domain and spatial domains filters for image smoothing and sharpening in MATLAB
CO4	Analyze the Image Segmentation, Representation and Object identification technique
CO5	Learn and apply Image Compression Techniques, Image Morphing Methods for digital images

COURSE CODE : 16IT7308 COURSE NAME : GENETIC ALGORITHMS	
CO1	Discover the knowledge to develop Genetic algorithm
CO2	Know the various Evolutionary algorithms and theorems.
CO3	Study the different Genetic programming
CO4	Implement the ACO collective Intelligence systems for various applications
CO5	Implement and apply the PSO collective Intelligence systems

COURSE CODE : 16IT7309 COURSE NAME : ADVANCED DATA STRUCTURES	
CO1	Basic ability to analyze algorithms and to determine algorithm correctness and time efficiency class.
CO2	Master a variety of advanced abstract data type (ADT) and data structures and their implementations.
CO3	Master different algorithm design techniques (brute-force, divide and conquer, greedy, etc.)
CO4	Ability to apply and implement learned algorithm design techniques and data structures to solve problems
CO5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data

COURSE CODE : 16IT7310 COURSE NAME : WIRELESS COMMUNICATION	
CO1	Illustrate the concept of cellular communication and the multiple access techniques.
CO2	Analyze the large scale fading channels and to predict the received signal strength. And analyze the multipath channels and categorize the various types of fading.

CO3	Analysis the analog and digital modulation techniques used in wireless communication
CO4	Comprehend the techniques to improve the signal quality.
CO5	CDiscuss the various wireless systems and standards

COURSE CODE : 16IT7311 COURSE NAME : SEMANTIC WEB	
CO1	Apply the fundamentals of semantic web technology
CO2	Apply and appreciate RDF and its taxonomy and ontology
CO3	Describe OWL and its usage in semantic web
CO4	Apply the various technologies related to semantic web services
CO5	Develop various applications of semantic web

COURSE CODE : 16IT7312 COURSE NAME : SOFTWARE PROJECT MANAGEMENT	
CO1	Construct and realize software design or software deployment.
CO2	Develop a budget, schedule or work plan.
CO3	Apply cost monitoring and control strategies for software projects
CO4	Understand the interdependencies between the processes of the system.
CO5	Manage the organizational behavior of people working in teams

COURSE CODE : 16IT8301 COURSE NAME : VIRTUAL AND AUGMENTED REALITY	
CO1	Explore different input and output devices used in virtual reality system.
CO2	Model the VR system.
CO3	Create scene graph using different toolkits.
CO4	Apply VR in various fields.
CO5	Apply visualization techniques for AR

COURSE CODE : 16IT8302 COURSE NAME : NATURAL LANGUAGE PROCESSING	
CO1	Be able to understand the basics of NLP
CO2	Analyze the natural language text. CO3: Generate the natural language.
CO3	Do machine translation.
CO4	Apply information retrieval techniques
CO5	Be able to understand the basics of NLP

COURSE CODE : 16IT8303 COURSE NAME : ADVANCED DATABASE TECHNOLOGY	
CO1	Understand the basics of Distributed and Parallel Databases Architectures
CO2	Understand and apply object oriented concept into the relational databases..
CO3	Apply XML databases to create Web pages

CO4	Understand the concepts of Data Mining and Data warehousing
CO5	Understand the applications of Advanced Databases to solve real world problems

COURSE CODE : 16IT8304 COURSE NAME : MOBILE AND ADHOC NETWORKS SE	
CO1	Understand the basics of Distributed and Parallel Databases Architectures
CO2	Understand and apply object oriented concept into the relational databases..
CO3	Apply XML databases to create Web pages
CO4	Understand the concepts of Data Mining and Data warehousing
CO5	Understand the applications of Advanced Databases to solve real world problems

COURSE CODE : 16IT8305 COURSE NAME : MEDIA ANALYTICS	
CO1	Explain the characteristics of social media analytics.
CO2	Explain the characteristics of network Analytics.
CO3	Analyze various protocols related media action and mobile analytics.
CO4	Design social media analytics based real time applications.
CO5	Implementation of media analytics in Business Alignment

COURSE CODE : 16IT8306 COURSE NAME : ENTERPRISE RESOURCE PLANNING	
CO1	Demonstrate the technologies such as Data warehousing, Datamining and OLAP with respect to ERP.
CO2	Illustrate all the concepts of ERP implementation process
CO3	Discover the ERP system performance and various ERP business modules
CO4	Summarize the market trends and software related to ERP in business world
CO5	InferTotal quality management concepts and Future Directions in ERP

COURSE CODE : 16IT8307 COURSE NAME : MULTIMEDIA MINING	
CO1	Gave a good knowledge of the fundamental concepts that provide the foundation of Multimedia mining
CO2	To understand the characteristics of multimedia data.
CO3	Discus the multimedia data indexing and data modeling.
CO4	Discuss the data modeling and evaluation:
CO5	Understand the application of multimedia mining

COURSE CODE : 16IT8308 COURSE NAME : SPEECH PROCESSING	
CO1	Model speech production system and describe the fundamentals of speech.

CO2	Extract and compare different speech parameters.
CO3	Choose an appropriate statistical speech model for a given application
CO4	Design a speech recognition system.
CO5	Use different speech synthesis techniques

COURSE CODE : 16IT8309 **COURSE NAME : INFORMATION STORAGE AND RETRIEVAL**	
CO1	Apply the fundamentals of IR
CO2	Design and implement IR concepts
CO3	Use an open source search engine framework and explore its capabilities
CO4	Build an innovative feature in a search engine
CO5	Design a smart information management system with Information Retrieval components

COURSE CODE : 16IT8310 **COURSE NAME : PERVASIVE COMPUTING**	
CO1	Explain the history of pervasive computing and its applications
CO2	Implement the hardware, software and interfaces.
CO3	Develop the web architecture for pervasive computing.
CO4	Design and develop WAP architecture, infrastructure and the security issues.
CO5	Have an understanding the PDA device categories, characteristics, software, browsers and various mobile applications
COURSE CODE : 16IT8311 **COURSE NAME : GRID COMPUTING**	
CO1	Students will understand the key concepts of Grid computing
CO2	Students will understand the Grid computing standards and its toolkits.
CO3	Students will be able to understand about Grid computing history ,evolution of Grid and its Security issues
CO4	Students will gain a basic knowledge on open Grid Services.
CO5	Students will be encouraged to adapt their research problem in a Grid environment as a project

COURSE CODE : 16IT8312 **COURSE NAME : E-COMMERCE**	
CO1	Demonstrate an understanding of the foundations and importance of E-commerce
CO2	Analyze the impact of E-commerce on business models and strategy
CO3	Describe the key features of Internet, Intranets and Extranets and explain how they relate to each other.
CO4	Discuss legal issues and privacy in E-Commerce
CO5	Recognize and discuss global E-commerce issues

COURSE CODE : 16IT7402 **COURSE NAME : WEB DEVELOPMENT ESSENTIALS**

CO1	Identify problems that are amenable to solution by AI methods.
CO2	Identify appropriate AI methods to solve a given problem.
CO3	Formalize a given problem in the language/framework of different AI methods.
CO4	Implement basic AI algorithms.
CO5	Design and carry out an empirical evaluation of different algorithms on a problem formalization, and state the conclusions that the evaluation supports

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	AGRICULTURE ENGINEERING
PROGRAMME NAME	B.E. AGRICULTURE ENGINEERING
REGULATIONS	2019 R

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme,

PEO1	Graduates shall exhibit their sound theoretical, practical skills and knowledge for successful employments or higher studies or research or entrepreneurial assignments.
PEO2	Graduates shall have lifelong learning skills, professional ethics and good communication capabilities along with entrepreneur skills and leadership, so that they can succeed in their life.
PEO3	Graduates shall become leaders and innovators by devising Engineering solutions for social issues and problems, thus caring for the society.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

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.

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PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling 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

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COURSE OUTCOMES (COs)

PROGRAM NAME –B.E. AGRICULTURE ENGINEERING

Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSE CODE : 21HE1101 COURSE NAME : TECHNICAL ENGLISH	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world
CO4	acquired various types of communication and etiquette
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE : 21MA1102 COURSE NAME : CALCULUS AND LINEAR ALGEBRA (MATRICES AND CALCULUS) (COMMON TO ALL BRANCHES)	
CO1	Apply the concept of differentiation in any curve.
CO2	Identify the maximum and minimum values of surfaces.
CO3	Apply double integrals to compute area of plane curves.
CO4	Evaluation of triple integrals to compute volume of solids.
CO5	Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies (or Eigen frequencies) of vibration and the shapes of these vibrational modes.

COURSE CODE : 21ME1153 COURSE NAME : BASICS OF CIVIL AND MECHANICAL ENGINEERING	
CO1	Demonstrate working principles of petrol and diesel engine.
CO2	Identify the components used in power plant cycle
CO3	Explain the components of Refrigeration and Air conditioning cycle.
CO4	Explain the usage of construction material and proper selection of construction materials.
CO5	Understand the building structures.

COURSE CODE : 21PH1151 COURSE NAME : APPLIED PHYSICS	
CO1	Illustrate the fundamental properties of matter
CO2	Discuss the Oscillatory motions of particles
CO3	Analyze the wavelength of different colors
CO4	Understand the advanced technology of LASER in the field of Engineering

CO5	Develop the technology of fiber optical communication in engineering field

COURSE CODE : 21CY1151 COURSE NAME : CHEMISTRY FOR ENGINEERS	
CO1	Differentiate hard and soft water and to solve the related problems on water purification and its significance in industries and daily life
CO2	Acquire the basic knowledge of polymers, composites and FRP and their significance.
CO3	Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences to minimize corrosion to improve industrial design.

COURSE CODE : 21CS1151 COURSE NAME : PYTHON PROGRAMMING AND PRACTICES	
CO1	Develop algorithmic solutions to simple computational problems
CO2	Structure simple Python programs for solving problems.
CO3	Decompose a Python program into functions.
CO4	Represent compound data using Python lists, tuples, dictionaries.
CO5	Read and write data from/to files in Python Programs.

COURSE CODE : 21GE1001 COURSE NAME : LANGUAGE COMPETENCY ENHANCEMENT COURSE- I	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication
CO3	Introduced to gain information of the professional world
CO4	acquired various types of communication and etiquette
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE : 21HE1072 COURSE NAME CAREER GUIDANCE LEVEL - I	
CO1	Enable students to approach learning Aptitude with ease, and understand recruiter expectation.

SEMESTER II

COURSE CODE : 21HE2101 COURSE NAME : BUSINESS ENGLISH FOR ENGINEERS	
CO1	Introduced to different modes and types of business communication.

CO2	Practiced to face and react to various professional situations efficiently.
CO3	learnt to practice managerial skills.
CO4	Familiarized with proper guidance to business writing.
CO5	Trained to analyze and respond to different types of communication.

COURSE CODE : 21MA2101 COURSE NAME : DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLES	
CO1	Apply few methods to solve different types of first order differential equations.
CO2	Develop sound knowledge of techniques in solving ordinary differential equations.
CO3	Solve Partial Differential Equations using various methods.
CO4	Infer the knowledge of construction of analytic functions and conformal mapping.
CO5	Evaluate real and complex integrals over suitable closed paths or contours.

COURSE CODE : 21AG2104 COURSE NAME : PRINCIPLES OF FOOD SCIENCE	
CO1	The students will be able to learn about food science, cooking methods and its quality
CO2	The students will be able to identify the preservation techniques in various food.
CO3	Understand the importance of cooking qualities of foods
CO4	Understand the properties and its role
CO5	Understand the classification and role of food additives

COURSE CODE : 21PH2151 COURSE NAME : MATERIALS SCIENCE	
CO1	Understand the purpose of acceptor or donor levels and the band gap of a semiconductor
CO2	Interpret the basic idea behind the process of magnetism and its applications in everyday
CO3	Discuss the behavior of super conducting materials
CO4	Illustrate the types and importance of crystal systems
CO5	Evaluate the production of ultrasonics and its applications in NDT

COURSE CODE : 21CY2151 COURSE NAME : ENVIRONMENTAL STUDIES	
CO1	Develop an understanding of different natural resources including renewable resources.
CO2	Realise the importance of ecosystem and biodiversity for maintaining ecological balance.
CO3	Understand the causes of environmental pollution and hazards due to manmade activities.

CO4	Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues.
CO5	Gain knowledge about the importance of women and child education and know about the existing technology to protect environment

COURSE CODE : 21IT2151 C OURSE NAME : PROGRAMMING IN C	
CO1	Select appropriate data types and control structures for solving a given problem.
CO2	Develop applications using arrays and strings
CO3	Understand the importance of functions, pointers and dynamic memory allocation.
CO4	Understand the Concepts of structures to develop applications in C

COURSE CODE : 21ME2001 COURSE NAME : ENGINEERING PRACTICES	
CO1	Fabricate wooden components and pipe connections including plumbing works.
CO2	Fabricate simple weld joints.
CO3	Fabricate different electrical wiring circuits and understand the AC Circuits
CO4	Determine the level of DO in a water sample.
CO5	Identify and estimate the different types of alkalinity in water sample
CO6	Estimate the amount of copper in a water sample
CO7	Determine the metal ion content using instrumental methods

COURSE CODE: 21HE2071 COURSEE NAME: LANGUAGE COMPETENCY ENHANCEMENT COURSE II	
CO1	Introduced to different modes and types of business communication
CO2	Practiced to face and react to various professional situation efficiently
CO3	Learnt to practice managerial skills
CO4	Familiarized with roper guidance to business writing
CO5	Trained to analyze and respond to different types of communication

COURSE CODE: 21HE2072 COURSEE NAME: CAREER GUIDANCE LEVEL - II	
CO1	Enable students to solve questions on Verbal, Logical and Quantitative Aptitude of placement level

COURSE CODE: 21HE2073 COURSEE NAME: ENTREPRENEURSHIP & INNOVATION	
CO1	Understand the nature of business opportunities, resources, and industries in critical and creative aspects.

CO2	Understand the processes by which innovation is fostered, managed, and commercialized.
CO3	Remember effectively and efficiently the potential of new business opportunities.
CO4	Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness.
CO5	Develop a business model for a new venture, including revenue. Margins, operations, working capital, and investment.

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COURSE OUTCOMES (COs)

SEMESTER III

COURSE CODE : 19MA3102 COURSE NAME : FOURIER ANALYSIS AND Z TRANSFORMS	
CO1	Understand the principles of Fourier series which helps them to solve physical problems of engineering.
CO2	Obtain the knowledge of Fourier series in solving the boundary value problems.
CO3	Familiar with the application of Fourier series in solving the two dimensional heat equations.
CO4	Acquire the knowledge of Fourier transform techniques which extend its applications.
CO5	Illustratethe Z- transforms for analyzing discrete-time signals and systems

COURSE CODE : 19AG3201 COURSE NAME : SOIL SCIENCE AND ENGINEERING	
CO1	Fundamental knowledge of soil physical parameters.
CO2	The procedures involved in soil survey, soil classification.
CO3	The phase relationship and soil compaction.
CO4	Concepts of bearing capacity and slope stability
CO5	Understanding the important of BIS standards

COURSE CODE : 19AG3202 COURSE NAME : FLUID MECHANICS AND HYDRAULICS	
CO1	Comprehend the properties of fluids
CO2	Understand the various types of fluid flow
CO3	Calculate the discharge and compute energy losses in pipe flow
CO4	Classify open channel flows and also design the most economical sections for open channel flows

CO5	Select appropriate model to provide solution to a real time problem related to hydraulics and also assess the performance of pumps

COURSE CODE : 19AG3204 COURSE NAME : PRINCIPLES AND PRACTICES OF CROP PRODUCTION	
CO1	Acquired knowledge on crop selection, crop production crop management.
CO2	Acquired knowledge in the area of production of agricultural and horticultural crops.
CO3	Understand the important of Crop water Management and Crop nutrition management in crop cultivation.
CO4	Understand the field crop production practices in Tamil Nadu.
CO5	Understand the role of greenhouse cultivation in future.

COURSE CODE : 19AG3251 COURSE NAME : UNIT OPERATIONS INAGRICULTURALPROCESSING	
CO1	Fundamentals of various unit operations of Agricultural Processing.
CO2	Understand the liquid characteristics and performance of single and multiple effect evaporation
CO3	Classify the filter media types and its requirements and sedimentation of particles in a fluid
CO4	Understand Size reduction equipment and calculating power required
CO5	Understand the equilibrium separation process and importance of crystallization and distillation in agricultural processing

COURSE CODE : 19AG3001 COURSE NAME : FIELD CROP PRODUCTION PRACTICAL	
CO1	Possess the knowledge on the agronomic practices for raising different crops and intensive cultivation through use of improved varieties and the liberal use of irrigation and fertilizers to increase the food production.
CO2	Utilize the knowledge on rainfed and dry land agriculture and precision farming.
CO3	Possess the knowledge on the commercial production of high-value horticultural crops such as fruits, vegetables, cut flowers, potted plants, bedding plants, and bulbs and floral design.
CO4	Possess the knowledge on harvesting methods, pre cooling, packaging and storage of horticultural crops.
CO5	To calculate cost of cultivation for various field crop

COURSE CODE : 19AG3002 COURSE NAME : SOIL SCIENCE LABORATORY	
CO1	Students will be able to describe the various mineral and organic components of soils, including how changes in various quantities affect soil physical and chemical properties
CO2	Students will understand pedogenesis and how different parent materials create soils with varying properties.

CO3	Students will understand water retention and movement in soils, especially as it relates to plant water availability
CO4	Students will develop a basic understanding of soil chemistry, including pH and CEC, especially how they relate to nutrient availability and, when feasible, adjustments, such as liming, that can improve conditions for plant growth.
CO5	Students will develop an introductory understanding of soil taxonomy, including the favorable traits and limitations of the various soil orders.

COURSE CODE : 19MC3191 COURSE NAME : INDIAN CONSTITUTION	
CO1	Understand the functions of the Indian government
CO2	Understand and abide the rules of the Indian constitution.

COURSE CODE : 19HE3072 COURSE NAME : CAREER GUIDANCE LEVEL - III	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays

COURSE CODE : 19HE3073 COURSE NAME : LEADERSHIP MANAGEMENT SKILLS	
CO1	To practice essential leadership skills in day to day operations
CO2	To work on leadership skills in the study environment
CO3	To understand and develop the skills consciously.
CO4	To know about the real worth of all the skills for success
CO5	To Analyze the real worth of the person and suggestion for improvement

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COURSE OUTCOMES (COs)

SEMESTER IV

COURSE CODE : 19AG4201 COURSE NAME : FARM TRACTORS	
CO1	The students will be able to understand the various equipments and mechanizations used in the farm
CO2	The students will have the knowledge on earth moving machineries, tractor classification and tillage implements
CO3	The students will able to understand various engine systems and its working principle
CO4	The student will able to understand various implements used in agriculture farm for various purposes

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CO5	The students will get basic idea about testing procedures of various farm machinery equipment's

COURSE CODE : 19AG4202 COURSE NAME : THERMODYNAMICS	
CO1	Classify mechanisms and inversions and determine mobility of a mechanism.
CO2	Construct cam profiles for various followers and turning moment diagram for flywheel.
CO3	Classify various gear trains and apply to automation.
CO4	Apply friction principles to clutches, belt, brake and screw.
CO5	Evaluate the sensitivity of governor

COURSE CODE : 19AG4203 COURSE NAME : IRRIGATION AND DRAINAGE ENGINEERING	
CO1	The students will have knowledge and skills on Planning, design, operation and management of reservoir system
CO2	The student will gain knowledge on different methods of irrigation
CO3	The student will able to understand various diversion and impounding structures
CO4	The student will grab knowledge about the command area development and canal irrigation system.
CO5	The students will retrieve basic idea about reclamation of the soils under water logged conditions and salinity problems

COURSE CODE : 19MA4152 COURSE NAME : STATISTICS & NUMERICAL METHODS	
CO1	Compute correlation between variables, and predict unknown values using regression.
CO2	Acquire skills in analyzing statistical methods
CO3	Have a clear perception of the statistical ideas and demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.
CO4	Understand the concept of interpolation in both cases of equal and unequal intervals.
CO5	Express the information from discrete data set through numerical differentiation and summary information through numerical integration

COURSE CODE : 19AG4251 COURSE NAME : BIO - ENERGY RESOURCE TECHNOLOGY	
CO1	The students will be able to understand the concepts of bio energy sources and its applications.
CO2	Possess knowledge on biochemical conversion technology and biofuels
CO3	Possess knowledge on reactors
CO4	Possess knowledge on thermal conversion technologies

CO5	Students understand the concepts of chemical reaction

COURSE CODE : 19AG4252 COURSE NAME : SURVEYING AND LEVELING	
CO1	Carryout preliminary surveying to prepare a layout of a given area
CO2	Apply compass surveying and plane table surveying
CO3	Understand the basics of leveling and measure the elevations
CO4	Plot contours and also calculate the capacity of reservoirs
CO5	To carry out linear and angular measurements using theodolite

COURSE CODE : 19AG4001 COURSE NAME : IRRIGATION FIELD LABORATORY	
CO1	Gain the knowledge on various meteorological instruments and understanding the concept of different irrigational systems in the laboratory tests.
CO2	Understand concept of different methods for estimation of evapotranspiration
CO3	Understand about irrigation management
CO4	Design various irrigation system
CO5	Able to schedule irrigation system

COURSE CODE : 19MC4191 COURSE NAME : ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	
CO1	Ability to understand the structure of Indian system of life.
CO2	Connect up and explain basics of Indian Traditional knowledge in modern scientific perspective

COURSE CODE : 19HE4072 COURSE NAME : CAREER GUIDANCE LEVEL – IV	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays

COURSE CODE : 19HE4073 COURSE NAME : IDEATION SKILLS	
CO1	Develop a strong understanding and importance of ideation
CO2	Learn about the different kinds of tools for Ideation.
CO3	Learn the need and significance of prototyping and its significance

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COURSE OUTCOMES (COs)

SEMESTER V

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COURSE CODE : 19AG5201 COURSE NAME : FARM MACHINERY AND EQUIPMENT	
CO1	The students will be able to perceive the role and significance of mechanization in sustaining agricultural production
CO2	The students will get acquainted the contextual usage of various equipment used in the farm for different field operations
CO3	The students will able to understand the working principle of every equipments used from sowing to harvesting.
CO4	The students will equip with technical knowledge and skills required for the operation, maintenance and evaluation of Tillage, Sowing and intercultural operational machinery needed for agricultural farms
CO5	To develop skills in the students required to develop and modification of indigenous farm machines as per the need of the area and farmers

COURSE CODE : 19AG5202 COURSE NAME : REFRIGERATION AND COLD CHAIN MANAGEMENT	
CO1	Introduction of basic principle of different refrigerating systems
CO2	Students will able to understand the effect of different components on the refrigerating machines
CO3	Upon completion of this course, the students will be able to demonstrate the operations in different Refrigeration & cold storage systems
CO4	They will also able to design Refrigeration & Cold storage systems to increase the shelflife of different agricultural commodities.
CO5	Students will able to understand various aspects of cold chain management and able to rectify chilling injuries.

COURSE CODE : 19AG5203 COURSE NAME : THEORY OF MACHINES	
CO1	The student will be able to Classify mechanisms and inversions and determine mobility of a mechanism.
CO2	Construct cam profiles for various followers and turning moment diagram for flywheel
CO3	Transmission through Gears: mechanism, gear trains, classification and analysis, familiarity with gear standardization.
CO4	Power transmission through belts and chains, mechanisms, materials
CO5	Evaluate the sensitivity of governor

COURSE CODE : 19AG5301 COURSE NAME : SYSTEMS ANALYSIS AND SOFT COMPUTING IN AGRICULTURAL ENGINEERING	
CO1	Student will acquire the knowledge on system concepts
CO2	Students will get knowledge about how to simulate various natural processes
CO3	Students will get knowledge about how to simulate various natural processes
CO4	Students can simulate various natural processes by using ANN
CO5	Students can able to solve various problems in the field of Agriculture Engineering by using fuzzy logic

COURSE CODE : 19AG5302 COURSE NAME : SUSTAINABLE AGRICULTURE AND FOOD SECURITY	
CO1	Upon completion of this course, the students will gain knowledge on the need for sustainable agriculture
CO2	They will be able to comprehend the need for food security on global level and the Nutritional Security
Co3	The students will be able to demonstrate how ecological balance is required for sustainability of agriculture
CO4	The students will be capable of understanding the applicability of rural and urban farming
CO5	The students will be able to identify various policies and programmes related to sustainable agriculture and food security

COURSE CODE : 19AG5303 COURSE NAME : CDM AND CARBON TRADING TECHNOLOGY	
CO1	Examine the effects of greenhouse gas emission and explain the responsibilities of countries in GHG emission
CO2	Outline the KYOTO PROTOCOL and develop clean development mechanism (CDM) projects.
CO3	Explain the features of CDM and employ monitoring and auditing techniques on CDM projects
CO4	Develop guidelines for small scale and Land Use, Land Use Change and Forestry (LULUCF) CDM projects
CO5	Compare the alternate techniques for lowering carbon emission.

COURSE CODE : 19AG5304 COURSE NAME : IT IN AGRICULTURAL SYSTEMS	
CO1	To know the Basic of Electric Circuits
CO2	To understand the importance of Precision Farming.
CO3	To manage the favourable conditions required for every crops separately
CO4	To solve the problems related to agriculture engineering by providing optimal conditions.
CO5	Understand about e-governance and agricultural systems management.

COURSE CODE : 19AG5305 COURSE NAME : ERGONOMICS AND SAFETY IN AGRICULTURAL ENGINEERING	
CO1	Understand role of human metabolism in design of agricultural implements.
CO2	To assessment of energy expenditure through various measuring techniques.
CO3	Understand the types of anthropometric data and its application in tool design
CO4	Understand the physiological effects of vibration and noise in work station.

CO5	To improve the performance of the farm systems by enlightening the human - machine interaction with safety measures.

COURSE CODE : 19AG5251 COURSE NAME : GROUNDWATER AND WELL ENGINEERING	
CO1	Students' knowledge base gets enriched with the technical aspects of groundwater, its availability, assessment and utilization
CO2	Student get nourished with the knowledge of well hydraulics in different types of aquifers
CO3	Students will get a thorough idea about different types of wells
CO4	Students will gain notion about construction of well
CO5	Better exposure to the theory behind well design, construction and water quality management is ensured

COURSE CODE : 19AG5252 COURSE NAME : SOIL AND WATER CONSERVATION ENGINEERING	
CO1	The students will be able to gain fundamental knowledge on the concepts of erosion
CO2	Students will obtain the knowledge of estimating soil erosion
CO3	They get enriched with knowledge on Hydrologic, Hydraulic and Structural designs of soil and water conservation measures
CO4	Students can able to design Rainwater harvesting systems
CO5	Students will receive concepts of sedimentation and detention tanks.

COURSE CODE : 19AG5001 COURSE NAME : OPERATION AND MAINTENANCE OF FARM MACHINERY LABORATORY	
CO1	The students will be able to identify farm equipment
CO2	Students will be able to calculate and predict the actual field problem during the operation
CO3	Trained to do adjustments of farm implements and Hitching of agricultural implements and trailers
CO4	Acquire knowledge on how to give care and maintenance to the farm machinery implements
CO5	Students will dismantle and assemble various machineries used in agriculture

COURSE CODE : 19AG5002 COURSE NAME : CAD FOR AGRICULTURAL ENGINEERING	
CO1	Understand of basic of engineering drawing and software usage
CO2	The students also will be able to design and draw the components using computer aided methods
CO3	The student will be able to understand the plan and layout of underground pipes, farm implements
CO4	Practicing to draw internal components of farm implements
CO5	Practice to draw farm shed in 2 D and 3 D view

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COURSE OUTCOMES (COs)

SEMESTER VI

COURSE CODE : 19AG6201 COURSE NAME : HYDROLOGY AND WATER RESOURCES ENGINEERING	
CO1	Understand the key drivers on water resources, hydrological processes and their integrated behavior in catchments
CO2	Ability to construct and apply a range of hydrological models to surface water and groundwater problems including Hydrograph, Flood/Drought management, artificial recharge
CO3	Ability to conduct Spatial analysis of rainfall data and design water storage reservoirs
CO4	Understand the concept and methods of ground water management
CO5	An understanding of the key drivers on water resources, hydrological processes and their integrated behavior in catchments.

COURSE CODE : 19AG6202 COURSE NAME: SOLAR AND WIND ENERGY ENGINEERING	
CO1	Understand the need of energy conversion and the various methods of energy storage
CO2	student able to explain the field applications of solar energy
CO3	understanding Winds energy as alternate form of energy and to know how it can be tapped
CO4	Illustrate the concepts of Direct Energy Conversion systems & their applications.
CO5	Select engineering approach to problem solving when implementing the projects on renewable sources.

COURSE CODE : 19AG6181 COURSE NAME : PROFESSIONAL ETHICS	
CO1	Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society
CO2	To learn Calibration Codes of Engineering Ethics
CO3	Understand the Intellectual Property Rights (IPR) for new invention
CO4	Assessment of Safety and Risk in effective way
CO5	Understand the importance of Corporate Social Responsibility

COURSE CODE : 19AG6301 COURSE NAME : CLIMATE CHANGE AND ADAPTATION

CO1	Demonstrate an understanding of how the threats and opportunities of predicted climate change will influence specific sectors at global and regional scale
CO2	Critically evaluate the relative opportunities and needs for mitigation and adaptation (including vulnerability assessments) in a variety of sectoral contexts
CO3	Understand and critically evaluate the scientific insights underlying the assessment reports of the IPCC, with a focus on impacts, adaptation and mitigation
CO4	Demonstrate an understanding of how the threats and opportunities of predicted climate change will influence specific sectors at global and regional scale
CO5	Effective utilization of MSV and bio waste

COURSE CODE : 19AG6302 **COURSE NAME : HEAT AND MASS TRANSFER FOR AGRICULTURAL ENGINEERS**	
CO1	Understand conduction, students will able to in different geometries
CO2	Asses the concepts and types of conversion in heat transfer mechanism
CO3	Recognize the radiation problems in various geometries
CO4	Analyze the performance of heat exchangers and evaporators
CO5	Understand the diffusion through a varying cross-sectional area

COURSE CODE : 19AG6303 **COURSE NAME : DISASTER MANAGEMENT**	
CO1	Differentiate the types of disasters, causes and their impact on environment and society
CO2	Assess vulnerability and various methods of risk reduction measures
CO3	Draw the hazard and vulnerability profiles and Scenarios in the Indian context for Disaster damage assessment and management
CO4	Knowledge in appropriate technology and local resource for disaster management
CO5	Involving case studies and collect the data from formers related to disaster management.

COURSE CODE : 19AG6304 **COURSE NAME : HORTICULTURAL CROP PROCESSING**	
CO1	Use the different types of sorting, grading, peeling, slicing, blanching and other equipment for processing of fruits and vegetables
CO2	Could Identify the suitable equipment, materials and methods for storage, processing, packaging and value addition of fruits and vegetables
CO3	Developed at least 4 types of value added products from fruits and vegetables
CO4	Understand the technical and management aspects of operation of fruits and vegetable processing industries

CO5	Understand the quality control processing industry

COURSE CODE : 19AG6305 COURSE NAME : ORGANIC FARMING TECHNOLOGIES	
CO1	Students gained knowledge on the concepts of organic farming
CO2	Students gained the knowledge on the crop management practices and technologies of various crops and cropping systems
CO3	Students learnt the standards, certification process and marketing strategy of organic produces
CO4	Student able to calculate cost economics for cultivation practices
CO5	Understanding the marketing and export potential of organic products

COURSE CODE : 19AG6401 COURSE NAME : MODERN AGRICULTURAL PRACTICES	
CO1	The students will be able to perceive the role and significance of mechanization in sustaining agricultural production
CO2	The students will get acquainted the contextual usage of various equipment used in the farm for different field operations.
CO3	The students will able to understand the working principle of every farm equipment's used from sowing to harvesting.
CO4	The students will equip with technical knowledge and skills required for the operation, maintenance of agricultural machineries
CO5	To develop skills in the students required to develop and modification of indigenous farm machines as per the need of the area and farmers

COURSE CODE : 19AG6251 COURSE NAME : FOOD AND DAIRY ENGINEERING	
CO1	The students will gain knowledge about Dairy and Food process engineering
CO2	Understand the process of manufacturing of dairy products and thermal processing of food.
CO3	Understand the importance of quality control and food preservation and packaging
CO4	Understand the Basic Chemical Kinetics during the milk process
CO5	Understand the various milk products and effluent treatment and disposal process

COURSE CODE : 19AG6252 COURSE NAME : ICT IN AGRICULTURAL ENGINEERING	
CO1	Understand the need of energy conversion and the various methods of energy storage
CO2	student able to explain the field applications of solar energy
CO3	understanding Winds energy as alternate form of energy and to know how it can be tapped
CO4	Illustrate the concepts of Direct Energy Conversion systems & their applications.

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CO5	Select engineering approach to problem solving when implementing the projects on renewable sources.

COURSE CODE : 19AG6701 **COURSE NAME : INDUSTRIAL TRAINING**	
CO1	Understand the working culture in industries/NGO and human relationship
CO2	Understand the variables involved in process sequence and optimization of process parameters
CO3	Analyze the research problem and formulate methodology to find a solution
CO4	Understand the manufacturing processes and marketing strategies
CO5	Get the exposure in testing and evaluation of tools, equipment and machinery and preparing a test report

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)**

DEPARTMENT NAME	AGRICULTURE ENGINEERING
PROGRAMME NAME	B.E. AGRICULTURE ENGINEERING
REGULATIONS	2016 R

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO1	Graduates shall exhibit their sound theoretical, practical skills and knowledge for successful employments or higher studies or research or entrepreneurial assignments.
PEO2	Graduates shall have lifelong learning skills, professional ethics and good communication capabilities along with entrepreneur skills and leadership, so that they can succeed in their life.
PEO3	Graduates shall become leaders and innovators by devising Engineering solutions for social issues and problems, thus caring for the society.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

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

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	including prediction and modeling 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.

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COURSE OUTCOMES (COs)

SEMESTER VII

COURSE CODE : 16AG7201 COURSE NAME : GROUNDWATER AND WELL ENGINEERING	
CO1	Students' knowledge base gets enriched with the technical aspects of groundwater, its availability, assessment and utilization
CO2	Student get nourished with the knowledge of well hydraulics in different types of aquifers
CO3	Students will get a thorough idea about different types of wells.
CO4	Students will gain notion about construction of well
CO5	Better exposure to the theory behind well design, construction and water quality management is ensured.

COURSE CODE : 16AG7202 COURSE NAME : REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM	
CO1	The students will understand the remote sensing principles, remote sensing systems satellite data processing and available data products.
CO2	Describe the process of data acquisition of satellite images and their characteristics
CO3	Compute an image visually and digitally with digital image processing techniques.
CO4	The students will understand decision making process using DBMS and utilization of these advanced techniques in addressing the real world problems
CO5	Compute knowledge of remote sensing and GIS in different agriculture engineering application

COURSE CODE : 16AG7203 COURSE NAME : SOLAR AND WIND ENERGY ENGINEERING	
CO1	Understand the need of energy conversion and the various methods of energy storage
CO2	To know solar energy applications in Agriculture production
CO3	Identify Winds energy as alternate form of energy and student able to know how it can be fully utilized.
CO4	Understand wind mill types and applications in energy storage
CO5	Understand the concepts of energy conversion systems and their applications.
COURSE CODE : 16AG7204	

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COURSE NAME : AGRICULTURAL EXTENSION	
CO1	To critically analyze different Agricultural Extension approaches.
CO2	Understand Agricultural Knowledge Information System
CO3	New trends in agriculture extension privatization extension.
CO4	C Monitoring and evaluation – concept and definition, monitoring, and evaluation of Extension programmes, Transfer of Technology-Concept and models
CO5	To expose with various Rural development programmes aimed at poverty alleviation and to increase employment opportunities and their analysis.

COURSE CODE : 16AG7301 COURSE NAME : INDUSTRIAL WASTE WATER MANAGEMENT GEMENT	
CO1	Understand the basic characteristics of wastewater.
CO2	To know the basic characteristics of wastewater and the kinetics of Biological system.
CO3	Acquire knowledge of residual pollutants in the effluent of conventionally treated wastewater and their removal by various advanced processes
CO4	Apply the knowledge of nutrients removal using advanced wastewater treatment processes design
CO5	Understand the basic concepts degradation of pollutants

COURSE CODE : 16AG7302 COURSE NAME : ERGONOMICS AND SAFETY IN AGRICULTURAL ENGINEERING	
CO1	Understand role of human metabolism in design of agricultural implements.
CO2	To assessment of energy expenditure through various measuring techniques.
CO3	Understand the types of anthropometric data and its application in tool design
CO4	Understand the physiological effects of vibration and noise in work station.
CO5	To improve the performance of the farm systems by enlightening the human - machine interaction with safety measures.

COURSE CODE : 16AG7303 COURSE NAME : ON FARM WATER MANAGEMENT	
CO1	To **design irrigation channels and understand the importance of** Water control and Diversion structure in agricultural area.
CO2	Understand about Irrigation demand and water requirement for crop cultivation
CO3	Understand the Physical characteristics of soil, depths of irrigation, field layout and water sources.
CO4	Understand the Climatic factors like frost potential, drought potential, rainfall amounts and intensities.

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CO5	Understand the Economic and market prices, material availability, labor cost and availability.

COURSE CODE : 16AG7304 **COURSE NAME : WATERSHED HYDROLOGY AND MANAGEMENT**	
CO1	An understanding of the key drivers on water resources, hydrological processes and their integrated behavior in catchments
CO2	Ability to construct and apply a range of hydrological models to surface water and groundwater problems including Hydrograph, Flood/Drought management, artificial recharge
CO3	Ability to conduct Spatial analysis of rainfall data and design water storage reservoirs
CO4	Understand the concept and methods of ground water management
CO5	understand the importance of RWH in rural and urban areas for improving ground water level.

COURSE CODE : 16AGI7001 COURSE NAME : GIS LABORATORY FOR AGRICULTURAL ENGINEERS	
CO1	Understand the process of data acquisition of satellite images and their characteristics
CO2	Understand the Image enhancement , Supervised and Unsupervised classification of image.
CO3	Understand the Database Management Systems of GIS application in agriculture.
CO4	:Understand the DEM usage in watershed analysis, rainfall - runoff and erosion modelling
CO5	The students will have adequate knowledge in application of RS and GIS in various fields of agricultural engineering.

COURSE CODE : 16AGI7002 COURSE NAME : RENEWABLE ENERGY LABORATORY	
CO1	Identifying categories of renewable energy sources and their application.
CO2	Design of floating drum and fixed doom type Bio-gass plant
CO3	Analysis gas composition like CH_4, CO2 and CO and H_2S through orsat apparatus
CO4	Understand the Stoichiometric calculations, weather station I-V Characteristics.
CO5	Testing of engines and solar water heater, dryer and Photovoltaic system and identifying performance of system.

COURSE CODE : 16AG7003 COURSE NAME : ICT IN AGRICULTURAL ENGINEERING	
CO1	Gain practical knowledge on various technologies in information and communication for agriculture.
CO2	Write various languages (*like.*, Java, C, Javascript, swift and PHP) to activate model.
CO3	Understand the importance of mobile apps in controlling various agricultural system
CO4	Practicing various tools in image processing and crop simulation software.
CO5	The students will able to develop automation system with help of ICT tool as well as properly applying in agriculture.

COURSE CODE : 16AG7701 COURSE NAME : APPLICATION OF DRONE AND ROBOTICS TECHNOLOGY IN AGRICULTURE	
CO1	Understand drone concepts and terminology
CO2	Understand the technology to transmit and receive data
CO3	Understand the various methods of programming and Install program on computer for successfully operating in agricultural field.
CO4	Understand the operational considerations and future scope of drone and robotic technologies in agriculture.

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CO5	Identify business opportunities with the use of drone and robotic technology in agriculture.

PROFESSIONAL ELECTIVE - IV

COURSE CODE : 16AG7305 COURSE NAME : INDUSTRIAL TRAINING/TECHNICAL SEMINAR	
CO1	Understand the working culture in industries/NGO and human relationship.
CO2	Understand the variables involved in process sequence and optimization of process parameters.
CO3	To analyze the research problem and formulate methodology to find a solution.
CO4	Understanding the manufacturing processes and marketing strategies.
CO5	To get the exposure in testing and evaluation of tools, equipment and machinery and preparing a test report.

COURSE CODE : 16AG7306 COURSE NAME : DAIRY PROCESS TECHNOLOGY	
CO1	Acquire the basic knowledge in dairy Technology
CO2	The ability to use the acquired knowledge during dairy processing
CO3	Students will learn about technologies to handle physical aspects of fluid-based process.
CO4	Understand the working principles of mordant equipment's which involves in dairy technology.
CO5	Understand the Sequence of operation during the packing process.

COURSE CODE : 16AG7307 COURSE NAME : STORAGE AND PACKAGING TECHNOLOGY	
CO1	Understand about different methods of food material damage and storage losses and estimation
CO2	Understand the packaging strategies for various environment in food industries.
CO3	Understand different types of packaging material and their properties and apply the knowledge in packaging various food materials.
CO4	Understand the selection of packages for specific food & agricultural commodities and advancement in food packaging
CO5	Understand the working principles of special packing equipment and its role emerging food industries.

COURSE CODE : 16AG7308 COURSE NAME : PROCESS ENGINEERING OF FRUITS AND VEGETABLES	
CO1	Understand the Importance of post harvest technologies and preventions of post harvesting losses.

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CO2	Understand the basic of cleaning, grading and on-farm processing for increasing the self-life of food grains
CO3	Understand the thermal and non-thermal techniques for preservation of fruits and vegetables
CO4	Understand the working principles of drying technologies and dehydration of fruits and vegetables
CO5	Understand the current storage technologies and its role in agriculture commodities

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COURSE OUTCOMES (COs)

SEMESTER VIII

COURSE CODE : 16AG8901 COURSE NAME : PROJECT WORK	
CO1	Students will be in a position to take up any challenging practical problem and find solution by formulating proper methodology.
CO2	Students will formulate a real world problem, identify the requirement and develop the design solutions
CO3	Students will utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project
CO4	Students will be able to identify technical ideas, strategies and methodologies
CO5	Students will be in a position to test and validate through conformance of the developed prototype and analysis the cost effectiveness

COURSE CODE : 16AG8301 COURSE NAME : AGRI BUSINESS MANAGEMENT AND ENTERPREUSHIP	
CO1	The students will analyze agribusiness situations, formulate strategies, implement plans and manage strategic change.
CO2	The students will learn the concepts and process of planning and organizing Human and other resource in industries
CO3	Students will understand the marketing principles, role of marketing and various marketing channels in domestic and international market.
CO4	Students will be capable of problem-solving integrated in the agribusiness value chain r to develop the business in the competitive marketing
CO5	Students will understand the systematic process to elect and ability to discern distinct entrepreneurial traits

COURSE CODE : 16AG8302

COURSE NAME : AGRICULTURAL ECONOMICS AND FARM MANAGEMENT	
CO1	Acquire fundamental knowledge and basic concepts of Economics and Farm Management
CO2	Students will be able to understand the types of resources and Investment analysis in agriculture sector
CO3	Students will be able to estimate the cost of cultivation and production of crops.
CO4	Students will be able to plan the financial aspects related to farm management in a cost effective manner.
CO5	Students will be able to handle Farm financial analysis, Investment and Budgeting for farms.

COURSE CODE : 16AG8303 COURSE NAME : INTELLECTUAL PROPERTY RIGHTS	
CO1	Students will able to understand the law relating to Intellectual Property and Competition in India.
CO2	Students will get an idea about IPR, registration and its enforcement.
CO3	Students can understand the intricacies of grant of Patent, Patentability, Licensing and Revocation at National and International levels.
CO4	Students realizes the Rights and Duties of Patentees.
CO5	Students will be equipped with knowledge of intellectual property rights (IPR) related protection systems, their significance and use of IPR as a tool for wealth and value creation in a knowledge based economy.

COURSE CODE : 16AG8304 COURSE NAME : AGRICULTURAL WASTE MANAGEMENT	
CO1	Environmental impacts of agricultural wastes
CO2	Various applications of agro-wastes
CO3	Nutritive value and energy production potential of agro wastes
CO4	Various eco-friendly methods for agricultural waste management.
CO5	Apply these management techniques in day to day life for better waste management

COURSE CODE : 16AG8305 COURSE NAME : SPECIAL FARM EQUIPMENT	
CO1	The students will have knowledge on the usage and working principles of machineries used for intercultural operations.
CO2	The students will have knowledge on the plant protection equipments.
CO3	The students will have knowledge on the usage and working principles of various harvesters.
CO4	The students will have knowledge on different threshers and other cutting machineries.

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CO5	The students will have a thorough knowledge on special farm equipment required for various agricultural operations

COURSE CODE : 16AG8306 **COURSE NAME : MECHANICS OF TILLAGE AND TRACTION**	
CO1	Students will have thorough knowledge on the fundamental of mechanics and dynamics in various tillage implements
CO2	Students will acquire knowledge on the relationship of soil parameters to understand the forces acting on tillage tools
CO3	Students will understand and analyze the dimensional analysis of different variables related to soil-tyre system.
CO4	Students will understand traction and its applications in agricultural tractors
CO5	Students will knew the dynamic properties of soil and soil compaction

COURSE CODE : 19AG8307 **COURSE NAME : MICRO IRRIGATION SYSTEMS**	
CO1	The students gain confidence with the exposure to different water saving micro-irrigation systems alongside the field-oriented designs and layouts
CO2	The students will be able to design cost effective drip irrigation layouts, benefitting the farmers for sustained productivity along with optimal water usage even under scarcity situations.
CO3	The students will be able to design cost effective Sprinkler irrigation layouts, benefitting the farmers for sustained productivity
CO4	The students will be able to design cost effective surge irrigation layouts, benefitting the farmers.
CO5	The students will be able to design cost effective sub-surface irrigation layouts.

COURSE CODE : 16AG8308 **COURSE NAME : AUTOMATION IN IRRIGATION**	
CO1	The students will understand the technologies available for automation
CO2	The students will acquire knowledge on Automatic Systems and IoT applications for irrigation.
CO3	The students will be trained to explore and use new technologies in Irrigation.
CO4	The students will be equipped to redesign the conventional methods to automated system for more efficient working.
CO5	The students would assess the parameters of irrigation using new technologies

COURSE CODE : 16AG7401 **COURSE NAME : EMERGING TECHNOLOGIES IN FOOD PROCESS ENGINEERING**

CO1	Understand the status of food processing industry and future prospects in growth of industries
CO2	Understand the latest trends in thermal processing and novelty in dehydration techniques.
CO3	Understand the need of high pressure and pulsed electric field processing in food industries.
CO4	Understand the role of non-thermal processing like hybrid drying technologies, NMR Technology in food industries
CO5	To identifying suitable Innovations in food refrigeration and minimal processing for improving self-life of fruits and vegetables.

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	BIOMEDICAL ENGINEERING
PROGRAMME NAME	B.E BIOMEDICAL ENGINEERING
REGULATIONS	R2021

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO1	To create a strong foundation in engineering and biology for solving the existing challenges in the healthcare sector.
PEO2	To acquire knowledge in the cutting edge technologies of Biomedical Engineering field and an ability to identify, analyze and solve problems in the field.
PEO3	To instill ethical values, communicative skills, teamwork and leadership skills necessary to function productively and professionally.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

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 modeling 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.
PO 9	**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.

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HICET

COURSE OUTCOMES (COs)

PROGRAM NAME – B.E. BME

Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSE CODE: 21HE1101 COURSE NAME: TECHNICAL ENGLISH	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	Acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills

COURSE CODE: 21MA1102 COURSE NAME: CALCULUS AND DIFFERENTIALEQUATIONS	
CO1	Apply the concept of differentiation in any curve.
CO2	Identify the maximum and minimum values of surfaces.
CO3	Apply double integrals to compute the area of plane curves
CO4	Evaluation of triple integrals to compute volume of solids
CO5	Develop sound knowledge of techniques in solving ordinary differential equation that model engineering problems

COURSECODE: 21PH1151 COURSE NAME: APPLIED PHYSICS	
CO1	Illustrate the fundamental properties of matter
CO2	Discuss the Oscillatory motions of particles
CO3	Analyze the wavelength of different colors
CO4	Understand the advanced technology of LASER in the field of Engineering
CO5	Develop the technology of fiber optical communication in engineering field

COURSE CODE: 21CY1151 COURSE NAME: CHEMISTRY FOR ENGINEERS	
CO1	Differentiate hard and soft water and to solve the related problems on water purification and its significance in industries and daily life.
CO2	Acquire the basic knowledge of polymers, composites and FRP and their significance.
CO3	Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion its consequences to minimize

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	corrosion to improve industrial design.
CO4	Develop knowledge about the renewable energy resources and batteries a long with the need of new materials to improve energy storage capabilities.
CO5	Identify the structure and characteristics of unknown/new compound with the help of spectroscopy.

COURSECODE: 21EE1155 COURSE NAME: BASICS OF ELECTRICAL OF ELECTRICAL ENGINEERING	
CO1	Understand the fundamental concepts of electrical circuits and theorems.
CO2	Understand the basic theory, operational characteristics of AC and DC machines
CO3	Understand the operating principles of measuring instrument.
CO4	Understand the electrical power supply sources and electrical wiring basics
CO5	Understand the importance for electrical safety and protection.

COURSECODE: 21CS1151 COURSE NAME: PYTHON PROGRAMMING AND PRACTICES	
CO1	Develop algorithmic solutions to simple computational problems
CO2	Read, write, execute by hand simple Python programs
CO3	Structure simple Python programs for solving problems and Decompose a Python program into functions
CO4	Represent compound data using Python lists, tuples, dictionaries
CO5	Read and write data from/to files in Python Programs.

COURSECODE: 21HE1071 COURSE NAME: LANGUAGE COMPETENCY ENHANCEMENT COURSE-I	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSECODE: 21HE1072 COURSE NAME: CAREER GUIDANCE LEVEL	
CO1	Enable students to approach learning Aptitude with ease, and understand recruiter expectation

COURSECODE: 21HE1073 COURSE NAME: ENTREPRENEURSHIP & INNOVATION	
CO1	Understand the nature of business opportunities, resources, and industries in critical and Creative aspects.
CO2	Understand the processes by which innovation is fostered,

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	managed, and commercialized.
CO3	Remember effectively and efficiently the potential of new business opportunities.
CO4	Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness.
CO5	Develop a business model for a new venture, including revenue. Margins, operations, Working capital, and investment.

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	**COURSE OUTCOMES (COs)**

PROGRAM NAME – B.E BME

Upon the successful completion of the course, the students will be able to

SEMESTER II

COURSE CODE: 19HE2101 **COURSE NAME: BUSINESS ENGLISH FOR ENGINEERS**	
CO1	Introduced to different modes and types of business communication.
CO2	Practiced to face and react to various professional situations efficiently.
CO3	learnt to practice managerial skills.
CO4	Familiarized with proper guidance to business writing.
CO5	Trained to analyze and respond to different types of communication.

COURSE CODE: 21MA2102 **COURSE NAME: COMPLEX VARIABLES ANDTRANSFORMCALCULUS**	
CO1	Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies.
CO2	Solve Partial Differential Equations using various methods.
CO3	Infer the knowledge of construction of analytic functions and conformal mapping.
CO4	Evaluate real and complex integral over suitable closed paths or contours.
CO5	Apply Laplace transformants properties to solve certain linear differentiable quotations.

COURSECODE: 21PH2151 **COURSENAME: MATERIAL SCIENCE**	
CO1	Understand the purpose of acceptor or donor levels and the band gap of a semiconductor
CO2	Interpret the basic idea behind the process of magnetism and its applications in everyday

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CO3	Discuss the behavior of super conducting materials
CO4	Illustrate the types and importance of crystal systems
CO5	Evaluate the production of ultrasonics and its applications in NDT

COURSE CODE: 21CY2151 **COURSE NAME: ENVIRONMENTAL STUDIES**	
CO1	Develop an understanding of different natural resources including renewable resources.
CO2	Realise the importance of ecosystem and biodiversity for maintaining ecological balance.
CO3	Understand the causes of environmental pollution and hazards due to manmade activities.
CO4	Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues.
CO5	Gain knowledge about the importance of women and child education and know about the existing technology to protect environment

COURSE CODE: 21CS2152 **COURSE NAME: ESSENTIAL OF IN C AND C++ PROGRAMMING**	
CO1	Develop simple applications in C using basic constructs.
CO2	Apply solutions to real world problems using basic characteristics of C++.
CO3	Write object-oriented programs using operator overloading, constructors and destructors.
CO4	Develop programs with the concepts of inheritance and polymorphism.
CO5	Understand and define solutions with C++ advanced features such as templates and exception handling

COURSE CODE: 21ME2154 **COURSE NAME: ENGINEERING GRAPHICS**	
CO1	Understand and interpret the engineering drawings in order to visualize the objects and draw the conics and special curves.
CO2	Draw the orthogonal projections of straight lines and planes.
CO3	Interpret the projections of simple solid objects in plan and elevation.
CO4	Draw the projections of section of solids and development of surfaces of solids.
CO5	Draw the isometric projections and the perspective views of different objects

COURSE CODE: 21ME2001 **COURSE NAME: ENGINEERING PRACTICES LABORATORY**	
CO1	Fabricate wooden components and pipe connections including plumbing works.
CO2	Fabricate simple weld joints.
CO3	CFabricate different electrical wiring circuits and

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	understand the AC Circuits

COURSE CODE: 19HE2071 COURSE NAME: LANGUAGE COMPETENCY ENHANCEMENT COURSE-II	
CO1	Introduced to different modes and types of business communication.
CO2	Practiced to face and react to various professional situations efficiently.
CO3	learnt to practice managerial skills.
CO4	Familiarized with proper guidance to business writing.
CO5	Trained to analyze and respond to different types of communication

COURSE CODE: 21HE2072 COURSE NAME: CAREER GUIDANCE LEVEL II	
CO1	Enable students to solve questions on Verbal, Logical and Quantitative Aptitude of placement level.

COURSE CODE: 21HE2073 COURSE NAME: ENTREPRENEURSHIP& INNOVATION	
CO1	Understand the nature of business opportunities, resources, and industries in critical and creative aspects.
CO2	Understand the processes by which innovation is fostered, managed, and commercialized..
CO3	Remember effectively and efficiently the potential of new business opportunities.
CO4	Assess the market potential l for a new venture, including customer need, competitors, and industry attractiveness
CO5	Develop a business model for a new venture, including revenue. Margins,operations,Workingcapital,and investment

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	COURSE OUTCOMES (COs)

PROGRAM NAME – B.E BME

Upon the successful completion of the course, the students will be able to

SEMESTER III	

COURSE CODE: 19MA3102 COURSE NAME: FOURIER ANALYSIS AND TRANSFORMS	
CO1	Understand the principles of Fourier series which helps them to solve physical problems of engineering.

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CO2	Employ Fourier series in solving the boundary value problems.
CO3	Understand Fourier series in solving the two dimensional heat equations.
CO4	Apply Fourier transform techniques which extend its applications.
CO5	Illustrate the Z-transforms for analyzing discrete-time signal sand systems.

COURSE CODE: 19BM3201 **COURSE NAME: ELECTRON DEVICES AND CIRCUITS**	
CO1	Ability to explain the theory, construction, and operation of PN junction diodes.
CO2	Ability to demonstrate the theory, construction, and operation of Transistors.
CO3	To understand the working of amplifiers.
CO4	To understand the working multistage amplifiers and differential amplifiers.
CO5	To differentiate different types of feedback amplifiers and oscillators.

COURSE CODE: 19BM3202 **COURSE NAME: MEDICAL BIOCHEMISTRY**	
CO1	Explain the fundamentals of biochemistry
CO2	Explain structural and functional properties of carbohydrates.
CO3	Explain structural and functional properties of lipids.
CO4	Explain structural and functional properties of proteins, and nucleic acids.
CO5	Discuss the role of enzyme sin human body.

COURSE CODE: 19BM3203 **COURSE NAME: HUMAN ANATOMY AND PHYSIOLOGY**	
CO1	Explain the basic structure and functions of cell.
CO2	Learn about the structure and functions of the skeletal, muscular and respiratory systems.
CO3	Understand about the cardiovascular and lymphatic systems.
CO4	Learn about the nervous and endocrine systems.
CO5	Explain about the structure and functions of the digestive and urinary systems urinary systems.

COURSE CODE: 19BM3251 **COURSE NAME: DIGITAL ELECTRONICS**	
CO1	Simplify Boolean functions using different methods.
CO2	Analyze, design and implement combinational logic circuits.
CO3	Analyze, design and implement Synchronous sequential logic circuits.



CO4	Analyze, design and implement Asynchronous sequential logic circuits.
CO5	Simulate and implement combinational and sequential circuits using HDL.

COURSE CODE: 19BM3001 COURSE NAME: ELECTRON DEVICES AND CIRCUITS LAB	
CO1	To understand the characteristics of PN junction diode, Zener diode and transistors.
CO2	To understand the concept of amplifiers and Oscillators.
CO3	Apply the concept of basic laws and network reduction theorems.

COURSE CODE: 19BM3002 COURSE NAME: BIOCHEMISTRY LABORATORY	
CO1	Understand the Biochemistry laboratory functional components.
CO2	Understand the basics knowledge of Biochemical parameter and their interpretation in Blood sample.
CO3	Understand the basics principle of preparation of buffers.

COURSE CODE: 19MC3191 COURSE NAME: INDIAN CONSTITUTION	
CO1	Understand the functions of the Indian government.
CO2	Understand and abide the rules of the Indian constitution.

COURSE CODE: 19HE3073 COURSE NAME: LEADERSHIP MANAGEMENT SKILLS	
CO1	To practice essential leadership skills in day to day operations
CO2	To work on leadership skills in the study environment
CO3	To understand and develop the skills consciously.
CO4	To know about the real worth of all the skills for success
CO5	To Analyze the real worth of the person and suggestion for improvement

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COURSE OUTCOMES (COs)

PROGRAM NAME – B.E BME

Upon the successful completion of the course, the students will be able to

SEMESTER IV

COURSE CODE: 19MA4152 COURSE NAME: STATISTICS & NUMERICAL METHODS	
CO1	Compute correlation and predict unknown values using regression together with R studio.
CO2	Understand the concepts of statistical methods for testing the hypothesis along with R studio.
CO3	Apply Design of Experiment techniques to solve various engineering problems in addition with R studio
CO4	Understand the concept of interpolation in both cases of equal and unequal intervals.
CO5	Identify various methods to perform numerical differentiation and integration.

COURSE CODE: 19BM4201 COURSE NAME: LINEAR INTEGRATED CIRCUITS	
CO1	To analyse the characteristics of op amp.
CO2	To design various applications of op amp.
CO3	To design various wave generating and shaping circuits.
CO4	To select ADC and DAC for various applications.
CO5	To design PLL and voltage regulators.

COURSE CODE: 19BM4202 COURSE NAME: BioMEMS AND NANOTECHNOLOGY	
CO1	Explain fabrication techniques of micro and nanotechnology
CO2	Learn about different types of MEMS sensor and actuators
CO3	Discuss about the Micro-Opto Electromechanical Systems & Micro fluidics
CO4	Describe the recent applications of MEMS and Nanotechnology in Medicine

COURSE CODE: 19BM4203 COURSE NAME: PATHOLOGY AND MICROBIOLOGY	
CO1	Analyze structural and functional aspects of living organisms.
CO2	Analyze the structure of disease causing organism.
CO3	Describe methods involved intreating the pathological diseases.
CO4	Explain the function of microscope.
CO5	Discuss the importance of public health.

COURSECODE: 19BM4251 COURSE NAME: SENSORS AND MEASUREMENT	
CO1	Measure various electrical parameters with accuracy, precision, resolution.

CO2	Select appropriate passive or active transducers for measurement of physical phenomenon.
CO3	Select appropriate light sensors for measurement of physical phenomenon.
CO4	Use AC and DC bridges for relevant parameter measurement.
CO5	Employ Multimeter, CRO and different types of recorders for appropriate measurement.

COURSE CODE: 19MC4191 COURSE NAME: VALUE EDUCATION-ESSENCE OF INDIAN TRADITIONAL KNOWLEDEGE	
CO1	Ability to understand the structure of Indian system of life.
CO2	Connect up and explain basics of Indian Traditional knowledge in modern scientific perspective.

COURSE CODE: 19BM4001 COURSE NAME: INTEGRATED CIRCUITS LABORATORY	
CO1	Design oscillators using operational amplifiers.
CO2	Design amplifiers using operational amplifiers.
CO3	Design filters using Op-amp and plot frequency response
CO4	Analyse the performance of oscillators using SPICE.
CO5	Analyse the performance of multi vibrators using SPICE

COURSE CODE: 19BM4002 COURSE NAME: HUMAN PHYSIOLOGY LABORATORY	
CO1	Identification and enumeration of blood cells
CO2	Enumeration of hematological parameters

COURSE CODE: 19HE4073 COURSE NAME: IDEATION SKILLS	
CO1	Develop a strong understanding and importance of ideation
CO2	Learn about the different kinds of tools for Ideation.
CO3	Learn the need and significance of prototyping and its significance

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COURSE OUTCOMES (COs)

PROGRAM NAME – B.E BME

Upon the successful completion of the course, the students will be able to

SEMESTER V

COURSE CODE: 19BM5201

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COURSE NAME: BIOCONTROL SYSTEMS	
CO1	Understand the need for mathematical modeling of various systems, representation of systems in block diagrams and signal flow graphs and are introduced to biological control systems
CO2	Analyze the time response of various systems and discuss the concept of system stability
CO3	Analyze the frequency response characteristics of various systems using different charts
CO4	Understand the concept of modeling basic physiological systems
CO5	Comprehend the application aspects of time and frequency response analysis in physiological control systems

COURSE CODE: 19BM5202 COURSE NAME: BIOMECHANICS	
CO1	Understand the use of mechanic sin medicine.
CO2	Understand the mechanics of physiological systems.
CO3	Distinguish the reason for abnormal patterns.
CO4	Analyze the biomechanical systems using mathematical models.
CO5	Design and develop the models specific to orthopedic applications.

COURSE CODE: 19BM5203 COURSE NAME: MICROPROCESSOR AND MICROCONTROLLERS	
CO1	Write Assembly Language programs using 8086 microprocessor.
CO2	Point out System Bus Structure and Multiprocessor Configuration.
CO3	Analyze the various peripheral devices interfacing with 8086 microprocessor.
CO4	Model and implement8051microcontrollerbasedsystems.
CO5	Experiment programson8051 microcontroller for interfacing various peripheral devices

COURSE CODE: 19BM5204 COURSE NAME: BIOMEDICAL INSTRUMENTATION	
CO1	To understand the various concepts of measurement systems.
CO2	To understand the method of designing bio amplifiers.
CO3	To understand about the Detection of physiological parameters using impedance techniques.
CO4	To understand about measurement of non electric parameter.
CO5	To understand about Patient safety and electromedical equipment.

COURSE CODE:19BM5251 COURSE NAME: VIRTUAL INSTRUMENTATION USING LAB VIEW	
CO1	Analyze Virtual Instrument sin Healthcare Domain.
CO2	Explain Virtual Instruments process and software.
CO3	Illustrate concepts of Lab VIEW in Real time application
CO4	Use DAQ for data acquisition and VI Toolkits for analysis.
CO5	Outline various research applications using LabVIEW.

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COURSE CODE: 16BM5001 COURSE NAME: MICROPROCESSOR AND MICROCONTROLLER LABORATORY	
CO1	Understand the basic arithmetic operation sin8085.
CO2	Ability to understand and analyze, about 8085 microprocessor.
CO3	Understanding of various interfacing techniques in microcontrollers.
CO4	Understand the basic arithmetic operations in 8051.
CO5	Analyze and demonstrate an mini project using microcontroller.

COURSE CODE: 16BM5002 COURSE NAME: BIOMEDICAL INSTRUMENTATION LABORATORY	
CO1	Identify various Bio-potential and their specifications in terms of amplitude and frequency.
CO2	Understand principle and working of various Biomedical Instruments for vital parameter monitoring
CO3	Decide the applications of the rape tic instruments for treatment purpose
CO4	Understand applications of imaging instruments and the modalities involved in each technique.
CO5	Understand applications of imaging instruments and the modalities involved in each technique.

COURSE CODE: 19HE5071 COURSE NAME: SOFT SKILLS - I	
CO1	Students will have clarity on their career exploration process and to match their skills and interests with a chosen career path.
CO2	Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others
CO3	Students will understand how teamwork can support leadership skills
CO4	Students will be able to make sense of problems, develop strategies to find solutions, and persevere in solving them.
CO5	Students will demonstrate an enhanced ability to draw logical conclusions and implications to solve logical problems

COURSE CODE: 19HE5072 COURSE NAME: DESIGN THINKING	
CO1	Develop a strong understanding of the Design Process
CO2	Learn to develop and test innovative ideas through a rapid iteration cycle.
CO3	Develop teamwork and leadership skills

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COURSE OUTCOMES (COs)

PROGRAM NAME – B.E BME

Upon the successful completion of the course, the students will be able to

SEMESTER VI

COURSE CODE: 19BM6201 COURSE NAME: BIO SIGNAL PROCESSING	
CO1	Understand the concepts of discrete time signals and its properties
CO2	Understand the steps involved in filter designing.
CO3	Develop knowledge on biomedical signals and the various processes involved in removing artifacts from the signal.
CO4	Understand the concepts of power spectrum estimation.
CO5	Understand the concepts of wavelets and its application in signal processing.

COURSE CODE: 16BM6202 COURSE NAME: RADIOLOGICAL EQUIPMENTS AND NUCLEAR MEDICINE	
CO1	Explain theory underlying machine learning.
CO2	Construct algorithms to Learn ANN.
CO3	Implement single layer feed forward networks.
CO4	Construct Algorithms To learn multi-layer feed forward networks.
CO5	Apply associative memories learning techniques for real life problems

COURSE CODE: 19HE6203 COURSE NAME: ENTREPRENEURSHIP DEVELOPMENT	
CO1	Know and understand the basics of entrepreneurship development.
CO2	Understand the role of creativity in entrepreneurship development.
CO3	Understand the concepts of developing an effective business model.
CO4	Learn the basics of appraisal of projects.
CO5	Understand the different forms of business organizations.

COURSE CODE: 19BM6251 COURSE NAME: DIAGNOSTIC AND THERAPEUTIC EQUIPMENT–I	
CO1	Explain about measurements of parameters related to Patient Monitoring Systems.

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CO2	Describe the measurement techniques of Blood gas analyzers and Oximeters.
CO3	Analyze different types and uses of Blood cell counters and Blood Flowmeters.
CO4	Discuss about the various coronary care equipment's used in hospitals.
CO5	Outline the different surgical and therapeutic equipment's used in hospitals

COURSE CODE: 19HE6071 COURSE NAME: SOFT SKILLS-II	
CO1	Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict.
CO2	Students will Actively participate meetings, Group Discussions / interviews and prepare & deliver presentations
CO3	Students will define professional behavior and suggest standards for appearance, actions and attitude in a Business environment
CO4	Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.
CO5	Students will excel in complex reasoning.

COURSE CODE: 19HE6072 COURSE NAME: INTELLECTUAL PROPERTY RIGHTS (IPR)	
CO1	Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.
CO2	Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.
CO3	Identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing.
CO4	Identify different types of trademarks and procedure for registration
CO5	Recognize the concept of design, geographical indication and procedure for registration

PROGRAM NAME – B.E BME

Upon the successful completion of the course, the students will be able to

COURSE CODE: 16BM7201 COURSE NAME: MEDICAL IMAGE PROCESSING	
CO1	Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.
CO2	Operate on images using the techniques of smoothing, sharpening and enhancement.
CO3	Understand the restoration concepts and filtering techniques.
CO4	Learn the basics of segmentation, features extraction, compression and recognition methods for color models.
CO5	Able to analyze image compression and recognition methods

COURSE CODE: 16BM7202 COURSE NAME: DIAGNOSTIC AND THERAPEUTIC EQUIPMENT – II	
CO1	Explain about measurements of parameters related to respiratory system.
CO2	Describe the measurement techniques of sensory responses.
CO3	Analyze different types and uses of diathermy units.
CO4	Discuss ultrasound imaging techniques and its usefulness in diagnosis.
CO5	Outline the importance of patient safety.

COURSE CODE: 16HE7104 COURSE NAME: ENTREPRENEURSHIP DEVELOPMENT	
CO1	Know and understand the basics of entrepreneurship development.
CO2	Understand the role of creativity in entrepreneurship development.
CO3	Understand the concepts of developing an effective business model.
CO4	Learn the basics of appraisal of projects.
CO5	Understand the different forms of business organizations

COURSE CODE: 16BM7001 COURSE NAME: MEDICAL IMAGE PROCESSING LABORATORY	
CO1	Develop and implement algorithms for image enhancement and storation
CO2	Observe filtering in spatial and frequency domain
CO3	Apply image compression
CO4	Develop programs for image segmentation and classification
CO5	Analyze the different filtering techniques on images.

COURSE CODE: 16BM5301 COURSE NAME: BIOMEMS AND NANOTECHNOLOGY	
CO1	Understand the fundamentals of micro and nanotechnology
CO2	Explain fabrication techniques of micro and nanotechnology
CO3	Learn about different types of MEMS sensor and actuators
CO4	Discuss about the Micro-Opto Electromechanical Systems & Micro fluidics

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CO5	Describe the recent applications of MEMS and Nanotechnology in Medicine

COURSE CODE: 16BM5302 COURSE NAME: BIOMATERIALS	
CO1	Analyze different types of Biomaterials and its classification and apply the concept of nanotechnology towards biomaterials use.
CO2	Identify significant gap required to overcome challenges and further development in metallic and ceramic materials
CO3	Identify significant gap required to overcome challenges and further development in polymeric materials
CO4	Create combinations of materials that could be used as a tissue replacement implant.
CO5	Understand the testing standards applied for biomaterials.

COURSE CODE: 16BM5303 COURSE NAME: TOTAL QUALITY MANAGEMENT	
CO1	The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.
CO2	Discuss TQM principles.
CO3	Able to use TQM Tools and Techniques
CO4	Apply Quality Function Deployment (QFD), Taguchi quality loss function.
CO5	The student would be able to apply the Quality Management System.

COURSE CODE: 16BM5304 COURSE NAME: HUMAN RIGHTS	
CO1	Engineering students will acquire the basic knowledge of human rights.
CO2	Know about various Rights in Human Rights.
CO3	Knowledge about UN Laws and Agencies.
CO4	Students will acquire the basic knowledge of Constitutional Provisions / Guarantees.
CO5	Knowledge about human rights of variety of people.

COURSE CODE: 16BM5305 COURSE NAME: INTELLECTUAL PROPERTY RIGHTS	
CO1	Ability to manage Intellectual Property portfolio to enhance the value of the firm.
CO2	Discuss registration of IPRs
CO3	Able to use Agreements and Legislations of IPR.
CO4	Use Digital products and Law
CO5	Acquire knowledge of IPR and its enforcement

COURSE CODE: 16BM6301 COURSE NAME: NANOTECHNOLOGY AND APPLICATIONS

CO1	Describe the basic science behind the properties of materials.
CO2	Interpret the creation, characterization, and manipulation of nanoscale materials.
CO3	Comprehend the exciting applications of nanotechnology at the leading edge of scientific research
CO4	Apply their knowledge of nanotechnology to identify how they can be exploited for new applications.
CO5	Apply applications of n**anotechnology.**

COURSE CODE: 16BM6302 **COURSE NAME: EMBEDDED SYSTEMS IN MEDICAL DEVICES**	
CO1	Explain overview of Processors and hardware units.
CO2	Apply Intel MCS51 Architecture.
CO3	Describe PIC Microcontroller.
CO4	Explain Embedded system evolution trends.
CO5	Apply applications of embedded system.

COURSE CODE: 16BM6303 **COURSE NAME: BIOPHOTONICS**	
CO1	Discuss Optics principle.
CO2	Describe Light-matter interactions
CO3	Analyze Optical Imaging
CO4	Apply Optical Imaging in biomedical.
CO5	Apply new applications of optical biosensors

COURSE CODE: 16BM6304 **COURSE NAME: BIOINFORMATICS**	
CO1	Explain UNIX commands, various types of network protocols and architecture of biological databases
CO2	Demonstrate and interpret the biological string matching by dot matrix and dynamic program algorithms
CO3	Apply, solve, interpret and analyze the heuristics based pairwise sequence analysis of macromolecules through various algorithms
CO4	Apply, solve, interpret and analyze the heuristics based multiple sequence analysis of macromolecules through various algorithms
CO5	Construct, interpret and assess the different molecular phylogenetic tree prediction and gene prediction algorithms

COURSE CODE: 16BM6305 **COURSE NAME: BIOMEDICAL WASTE MANAGEMENT**	
CO1	Analyse various hazards, accidents and its control
CO2	Design waste disposal procedures for different biowastes
CO3	Categorise different biowastes based on its properties
CO4	Design different safety facility in hospitals
CO5	Propose various regulations and safety norms

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COURSE CODE: 16BM7301 COURSE NAME: ARTIFICIAL ORGANS AND IMPLANTS	
CO1	Gain adequate knowledge about artificial organs and transplants.
CO2	Have in-depth knowledge aboutArtificial kidney
CO3	Have in-depth knowledge about Artificial heart-lung machine
CO4	Explain different types of Rehabilitation Engineering techniques.
CO5	Get clear idea about implant design and its parameters and solution

COURSE CODE: 16BM7302 COURSE NAME: VLSI DESIGN	
CO1	Explain the basic CMOS circuits and the CMOS process technology.
CO2	Discuss the techniques of chip design using programmable devices.
CO3	Model the digital system using Hardware Description Language.
CO4	To understand about FPGA and its implentation strategies.
CO5	To explain in detail about designing of arithmetic building blocks.

COURSE CODE: 16BM7303 COURSE NAME: ADVANCED BIO ANALYTICAL AND THERAPEUTIC TECHNIQUES	
CO1	Comprehend and appreciate the significance of analytical techniques
CO2	Demonstrate the knowledge of enzymes as a diagnostic tool
CO3	Understand the concept and methods of Radio-isotopic techniques
CO4	Describe the details and ethical issues in human gene therapy
CO5	Gain knowledge about the concepts of nano-therapeutics in drug delivery

COURSE CODE: 16BM7304 COURSE NAME: INTERNET OF THINGS AND ITS MEDICAL APPLICATIONS	
CO1	Outline the basic concepts of IoT
CO2	Discuss about Embedded IoT
CO3	Summarize the IoT protocols
CO4	Choose a suitable devices and implement program for stated IoT challenge
CO5	Explain the fundamentals of security in IoT

COURSE CODE: 16BM7305 COURSE NAME: NEURAL ENGINEERING	
CO1	Understand the physiology behind generation of neural prosthesis.
CO2	Describe various techniques that are used to evaluate the functioning of neural prosthesis

CO3	Differentiate between a normal and abnormal signal coming from a healthy and a diseased nervous system respectively.
CO4	Analyze the applications of neuro robotics
CO5	Discuss about the electrophysiological evaluation in special situations.

COURSE CODE: 16BM7306 COURSE NAME: BIOFLUIDS AND DYNAMICS	
CO1	Understand the principles of biofluid mechanics
CO2	Outline the flow properties of blood.
CO3	Discuss on Cardiovascular and pulmonary system in human body
CO4	Explain blood properties ,especially the anatomy and physiology of soft tissues.
CO5	Understanding the concepts of orthopedic mechanics.

COURSE CODE: 16BM7307 COURSE NAME: ARTIFICIAL NEURAL NETWORKS	
CO1	Explain theory underlying machine learning.
CO2	Construct algorithms to Learn ANN.
CO3	Implement single layer feed forward networks.
CO4	Construct Algorithms To learn multi- layer feed forward networks.
CO5	Apply associative memories learning techniques for real life problems

COURSE CODE: 16BM7308 COURSE NAME: MEDICAL DATA ANALYTICS	
CO1	Demonstrate the knowledge on basics of health care data
CO2	Identify the various statistical learning methods
CO3	Identify and utilize the algorithms for regression and classification
CO4	Identify and utilize the algorithms for regression and classification
CO5	Utilize various data computational tools

COURSE CODE: 16BM7309 COURSE NAME: MEDICAL DATA ANALYTICS	
CO1	Understand the basics of robotic systems.
CO2	Design basic Robotics system and formulate Kinematics.
CO3	Construct Inverse Kinematic motion planning solutions for various Robotic configurations.
CO4	Understanding the importance of robots in rehabilitation.
CO5	Design Robotic systems for Medical application

COURSE CODE: 16BM7310 COURSE NAME: CANCER BIOLOGY	
CO1	To appreciate the role of immune system in cancer.
CO2	To describe self – tolerance machinery and immune surveillance.

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CO3	To understand the cancer microenvironment and its influence on immune cells.
CO4	To have awareness on medical radiation therapy against cancer.
CO5	To understand about variuos screening methods available for cancer.

COURSE CODE: 16BM8301 COURSE NAME: ARTIFICIAL INTELLENGENCE	
CO1	Use appropriate search algorithms for any AI problem
CO2	Represent a problem using first order and predicate logic
CO3	Provide the apt agent strategy to solve a given problem
CO4	Design software agents to solve a problem
CO5	Design medical applications in Artificial Intelligence.

COURSE CODE: 16BM8302 COURSE NAME: MACHINE LEARNING TECHNIQUES IN MEDICINE	
CO1	Understand the concepts of machine learning..
CO2	Explain the processes involved in supervised learning
CO3	Learn the concept of neural networks.
CO4	Understand the steps involved in feature selection.
CO5	Understand the procedures involved in unsupervised learning.

COURSE CODE: 16BM8303 COURSE NAME: MEDICAL DEVICE DESIGN	
CO1	Understand the basic steps involved in design of biomedical devices and systems.
CO2	Understand about product development, specification and requirements
CO3	Understand hardware development methods and tools.
CO4	Understand software development methods and tools
CO5	Understand about biological engineering designs.

COURSE CODE: 16BM8304 COURSE NAME: TELEMEDICINE	
CO1	Understand the concepts of telemedicine, telehealth and telecare.
CO2	Acquire knowledge in different types of information and standards used in telemedicine.
CO3	Understand the applications of telemedicine.
CO4	Explain the use of internet in telemedicine
CO5	Learn the ethical and legal aspects in telemedicine.

COURSE CODE: 16BM8305 COURSE NAME: WEARABLE MEDICAL DEVICES	
CO1	Develop applications in C using pointers and structures.
CO2	Acquire knowledge the most common abstractions for data collections (e.g., stacks, queues, lists).

CO3	Use non linear data structures such as trees to solve problems. .
CO4	Apply Graph algorithms to find the shortest path cost
CO5	Apply Algorithms for solving problems like sorting and searching.

COURSE CODE: 16BM8306 COURSE NAME: REHABILITATION ENGINEERING	
CO1	Gain adequate knowledge about the needs of rehabilitations and its future development
CO2	Have an in depth idea about Engineering Concepts in Sensory & Motor rehabilitation.
CO3	Apply the different types of Therapeutic Exercise Technique to benefit the society.
CO4	Design and apply different types Hearing aids, visual aids and their application in biomedical field and hence the benefit of the society.
CO5	Gain in-depth knowledge about different types of models of Hand and arm replacement.

COURSE CODE: 16BM8307 COURSE NAME: PHYSIOLOGICAL MODELLING	
CO1	Gain adequate knowledge about the modeling of physiological systems
CO2	Have an in depth idea about different approaches in modeling physiological systems
CO3	Design and develop the physiological model of human thermal regulatory system
CO4	Design and develop the physiological model of human respiratory system
CO5	Gain in-depth knowledge about different types of neuron models and its electrical properties

COURSE CODE: 16BM8308 COURSE NAME: BIOMETRICS	
CO1	Understand the basic technologies used in biometric systems
CO2	Acquire knowledge the most common abstractions for data collections (e.g., stacks, queues, lists).
CO3	Use non linear data structures such as trees to solve problems
CO4	Apply Graph algorithms to find the shortest path cost
CO5	Apply Algorithms for solving problems like sorting and searching.

COURSE CODE: 16BM8309 COURSE NAME: INTERNET OF THINGS	
CO1	Explain the concept of IoT
CO2	Analyze various protocols for IoT
CO3	Design a PoC of an IoT system using Rasperry Pi/Arduino. .
CO4	Apply data analytics and use cloud offerings related to IoT
CO5	Analyze applications of IoT in real time scenario

COURSE CODE: 16BM8310 COURSE NAME: BRAIN COMPUTER INTERFACE	
CO1	Comprehend and appreciate the significance and role of this course in the present contemporary world
CO2	Evaluate concept of BCI
CO3	Assign functions appropriately to the human and to the machine.
CO4	Select appropriate feature extraction methods
CO5	Use machine learning algorithms for translation.

COURSE CODE: 16BM6401 COURSE NAME: FRONTIERS IN BIOMEDICAL ENGINEERING	
CO1	Understand the various perspectives of biomedical engineering.
CO2	Understand the concept of biomedical imaging and computation involved.
CO3	Understand the various equipment used in clinical environment
CO4	Understand the concepts of biomechanics and rehabilitation engineering
CO5	Understand the concepts of tissue and molecular engineering.

COURSE CODE: 16BM7401 COURSE NAME: FIRST AID IN EMERGENCY CARE	
CO1	Explain the Introduction to First aid.
CO2	Familiar with emergency First aid.
CO3	Discuss about First aid technologies.
CO4	Explain the emergency equipment.
CO5	Discuss about the various healthcare technologies.

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	FOOD TECHNOLOGY
PROGRAMME NAME	FOOD TECHNOLOGY
REGULATIONS	R 2019

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO 1	Utilize the principles of food science and Engineering to face various professional career challenges
PEO 2	Analyze and create new food products and process for real world application with technical feasibility
PEO 3	Exhibit professional and managerial capabilities with ethical conduct for continuous learning

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

PO 1	**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 modeling 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

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	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.
PO 9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**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.
PO 11	**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.
PO 12	**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.



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COURSE OUTCOMES (COs)

PROGRAM NAME – FOOD TECHNOLOGY

Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSE CODE: 21HE1101 COURSE NAME: TECHNICAL ENGLISH	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	Acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE: 21MA1102 COURSE NAME: CALCULUS AND LINEAR ALGEBRA	
CO1	Apply the concept of differentiation in any curve.
CO2	Identify the maximum and minimum values of surfaces.
CO3	Apply double integrals to compute area of plane curves.
CO4	Evaluation of triple integrals to compute volume of solids.
CO5	Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies (or Eigen frequencies) of vibration and the shapes of these vibrational modes.

COURSE CODE: 21ME1101 COURSE NAME: BASIC CIVIL AND MECHANICAL ENGINEERING	
CO1	Apply the concept of differentiation in any curve.
CO2	Identify the maximum and minimum values of surfaces.
CO3	Apply double integrals to compute area of plane curves.
CO4	Evaluation of triple integrals to compute volume of solids.
CO5	Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies (or Eigen frequencies) of vibration and the shapes of these vibrational modes.

COURSE CODE: 21PH1151 COURSE NAME: APPLIED PHYSICS	
CO1	Illustrate the fundamental properties of matter
CO2	Discuss the Oscillatory motions of particles
CO3	Analyze the wavelength of different colors
CO4	Understand the advanced technology of LASER in the field of Engineering

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CO5	Develop the technology of fiber optical communication in engineering field

COURSE CODE: 21CY1151 COURSE NAME: CHEMISTRY FOR ENGINEERS	
CO1	Differentiate hard and soft water and to solve the related problems on water purification and its significance in industries and daily life
CO2	Acquire the basic knowledge of polymers, composites and FRP and their significance.
CO3	Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences to minimize corrosion to improve industrial design.
CO4	Develop knowledge about the renewable energy resources and batteries along with the need of new materials to improve energy storage capabilities.
CO5	Identify the structure and characteristics of unknown/new compound with the help of spectroscopy.

COURSE CODE: 21CS1151 COURSE NAME: PYTHON PROGRAMMING AND PRACTICES	
CO1	Develop algorithmic solutions to simple computational problems
CO2	Read, write, execute by hand simple Python programs
CO3	Structure simple Python programs for solving problems and Decompose a Python program into functions
CO4	Represent compound data using Python lists, tuples, dictionaries
CO5	Read and write data from/to files in Python Programs.

COURSE CODE: 21HE1001 COURSE NAME: LANGUAGE COMPETENCY ENHANCEMENT COURSE - I	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	Acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE: 21HE1072 COURSE NAME: CAREER GUIDANCE LEVEL I	
CO1	Enable students to approach learning Aptitude with ease, and understand recruiter expectation.

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SEMESTER II

COURSE CODE: 21HE2101 COURSE NAME: BUSINESS ENGLISH FOR ENGINEERS	
CO1	To know different modes of business communication
CO2	To understand managerial techniques
CO3	To apply the rules of grammar and vocabulary in effective business communication
CO4	To analyze and interpret business documents
CO5	To draft business reports

COURSE CODE: 21MA2101 COURSE NAME: DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLES	
CO1	Apply few methods to solve different types of first order differential equations.
CO2	Develop sound knowledge of techniques in solving ordinary differential equations.
CO3	Solve Partial Differential Equations using various methods.
CO4	Infer the knowledge of construction of analytic functions and conformal mapping.
CO5	Evaluate real and complex integrals over suitable closed paths or contours.

COURSE CODE: 21FT2105 COURSE NAME: PRINCIPLES OF MICROBIOLOGY	
CO1	Acquire knowledge on historical developments in microbiology.
CO2	Classify and identify the structure of microorganisms
CO3	Interpret the different types of microscopes and staining techniques
CO4	Formulate media for microbial growth
CO5	Identify the technique used for isolation and control of microorganisms

COURSE CODE: 21IT2151 COURSE NAME: PROGRAMMING IN C	
CO1	Select appropriate data types and control structures for solving a given problem.
CO2	Develop applications using arrays and strings
CO3	Understand the importance of functions, pointers and dynamic memory allocation.
CO4	Understand the Concepts of structures to develop applications in C using
CO5	Applying the concepts of files in programming

COURSE CODE: 21PH2151

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COURSE NAME: MATERIAL SCIENCE	
CO1	Understand the purpose of acceptor or donor levels and the band gap of a semiconductor
CO2	Interpret the basic idea behind the process of magnetism and its applications in everyday
CO3	Discuss the behavior of super conducting materials
CO4	Illustrate the types and importance of crystal systems
CO5	Evaluate the production of ultrasonics and its applications in NDT

COURSE CODE: 21CY2151 COURSE NAME: ENVIRONMENTAL STUDIES	
CO1	Realise the importance of ecosystem and biodiversity for maintaining ecological balance.
CO2	Understand the causes of environmental pollution and hazards due to manmade activities.
CO3	Develop an understanding of different natural resources including renewable resources.
CO4	Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues.
CO5	Gain knowledge about the importance of women and child education and know about the existing technology to protect environment

COURSE CODE: 21ME2001 COURSE NAME: ENGINEERING PRACTICES LABORATORY	
CO1	Fabricate wooden components and pipe connections including plumbing works
CO2	Fabricate simple weld joints.
CO3	Fabricate different electrical wiring circuits and understand the AC Circuits.

COURSE CODE: 21HE2071 COURSE NAME: LANGUAGE COMPETENCY ENHANCEMENT COURSE - II	
CO1	Introduced to different modes and types of business communication.
CO2	Practiced to face and react to various professional situations efficiently.
CO3	Learnt to practice managerial skills.
CO4	Familiarized with proper guidance to business writing.
CO5	Trained to analyze and respond to different types of communication.

COURSE CODE: 21HE2072 COURSE NAME: CAREER GUIDANCE LEVEL II	
CO1	Enable students to solve questions on Verbal, Logical and Quantitative Aptitude of placement level

COURSE CODE: 21HE2073 COURSE NAME: ENTREPRENEURSHIP & INNOVATION

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CO1	Understand the nature of business opportunities, resources, and industries in critical and creative aspects.
CO2	Understand the processes by which innovation is fostered, managed, and commercialized.
CO3	Remember effectively and efficiently the potential of new business opportunities.
CO4	Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness..
CO5	Develop a business model for a new venture, including revenue. Margins, operations, working capital, and investment.

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COURSE OUTCOMES (COs)

SEMESTER III

COURSE CODE: 21MA3102 COURSE NAME: FOURIER ANALYSIS AND TRANSFORMS	
CO1	Understand the principles of Fourier series which helps them to solve physical problems of engineering.
CO2	Employ Fourier series in solving the boundary value problems.
CO3	Understand Fourier series in solving the two dimensional heat equations.
CO4	Apply Fourier transform techniques which extend its applications.
CO5	Illustrate the Z- transforms for analyzing discrete-time signals and systems.

COURSE CODE: 21FT3201 COURSE NAME: FLUID MECHANICS	
CO1	Classify fluids, apply hydrostatic equilibrium and dimensional analysis in fluid flow behaviour
CO2	Derive and apply basic equations of fluid flow
CO3	Analyze fluid flow through porous media and select suitable mixing equipment used in food industries
CO4	Select and evaluate the performance of pumps
CO5	Illustrate the principle and application of different flow measuring devices and valves

COURSE CODE: 21FT3101 COURSE NAME: PRINCIPLES OF THERMODYNAMICS	
CO1	Outline the basic concepts and apply the first law of thermodynamics in selected processes
CO2	Understand the principle of second law of thermodynamics and concepts of Carnot cycle
CO3	Interpret the second law of thermodynamics and relate the properties of pure substance
CO4	Estimate the properties of steam and measurement of quality of steam using calorimeters
CO5	Integrate the use of simple calculation in gaining the working knowledge of different boilers.

COURSE CODE: 21FT3202 COURSE NAME: FOOD MICROBIOLOGY	
CO1	Recognize the sources and factors influencing the microbial growth
CO2	Identify the techniques used to assess the microbial load and

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CO3	Apply the knowledge of microorganism in fermentation process
CO4	Interpret microbial spoilage of different foods
CO5	Distinguish food borne diseases and intoxication caused by microorganisms

COURSE CODE: 21FT3251 **COURSE NAME: BIOCHEMISTRY**	
CO1	Interpret the structure and properties of carbohydrates
CO2	Recall the structure and properties of lipids
CO3	Recognize the structural and functional role of proteins
CO4	Classify the enzymes and interpret the enzyme action and their immobilization
CO5	Infer the structure of nucleic acids and illustrate the basics of energy metabolism

COURSE CODE: 21FT3001 **COURSE NAME: FOOD MICROBIOLOGY LABORATORY**	
CO1	Complete understanding of isolation, characterization of various microbes associated with foods and food groups.
CO2	Familiarize with microbiological techniques for the study of foods.
CO3	Better understanding of methods to detect pathogens in foods.
CO4	Inoculate, isolate and identify the microorganism from both liquid and solid samples
CO5	Select the appropriate equipment for Microbiological works

COURSE CODE: 21FT3002 **COURSE NAME: FOOD PRODUCTION ANALYSIS LABORATORY**	
CO1	Analyze the additives present in food
CO2	Familiarize with the nutrients after processing
CO3	Better understanding of processed foods with compliance to standards
CO4	Demonstrate simple detection methods of food adulteration
CO5	Implement the hygienic practices in food processing industry

COURSE CODE: 21MC3191 **COURSE NAME: INDIAN CONSTITUTION**	
CO1	Understand the history of Indian Constitution.
CO2	Understand the fundamental rights and amendment of Government.
CO3	Understand the functions of the Indian government.
CO4	Understand and abide the rules of the Indian constitution.
CO5	Understand the various constitutional schemes of Indian government.

COURSE CODE: 19HE3072 **COURSE NAME: INDIAN CAREER GUIDANCE LEVEL - III**	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

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COURSE CODE: 19HE3073 COURSE NAME: LEADERSHIP MANAGEMENT SKILLS	
CO1	To practice essential leadership skills in day to day operations
CO2	To work on leadership skills in the study environment
CO3	To understand and develop the skills consciously.
CO4	To know about the real worth of all the skills for success
CO5	To Analyze the real worth of the person and suggestion for improvement

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COURSE OUTCOMES (COs)

SEMESTER IV

COURSE CODE: 21FT4201R COURSE NAME: FUNDAMENTALS OF HEAT AND MASS TRANSFER	
CO1	Understanding the concept of steady state and unsteady state and application of Fourier law of conduction
CO2	Understanding free and forced convection and application of Newtons law of cooling
CO3	Understanding the different types of heat exchangers and its application
CO4	Understand and apply the concepts of radiation and Stephan boltzman's law
CO5	Understand the mass transfer phenomena using Fick's law of molecular diffusion

COURSE CODE: 19FT4202R COURSE NAME: ENGINEERING PROPERTIES OF FOOD MATERIALS	
CO1	Interpret the physical properties of agricultural materials
CO2	Elaborate the thermal properties and its application
CO3	Outline the optical and electromagnetic properties
CO4	Recognize the rheological properties of food materials
CO5	Infer textural properties and color measurements of food materials

COURSE CODE: 19FT4204 COURSE NAME: REFRIGERATION AND COLD CHAIN MANAGEMENT	
CO1	Understand the basics of refrigeration with thermodynamic principles and Carnot cycle
CO2	Understand the concept of refrigeration cycles
CO3	Remember the various components of refrigeration system and its types

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CO4	Understand the concept of low temperature storage systems for foods
CO5	Understand and apply cold chain and refrigeration for food products

COURSE CODE: 19FT4251 COURSE NAME: FOOD CHEMISTRY	
CO1	Interpret the nutritional importance of foods and water
CO2	Summarize the nutritional importance of vitamins and minerals
CO3	Recognize the changes in food components during cooking, processing and storage
CO4	Modify the carbohydrates, proteins and fats based on its functional properties
CO5	Apply the different methods of food preservation

COURSE CODE: 19MA4152 COURSE NAME: STATISTICS & NUMERICAL METHODS	
CO1	Compute correlation and predict unknown values using regression together with R studio.
CO2	Understand the concepts of statistical methods for testing the hypothesis along with R studio.
CO3	Apply Design of Experiment techniques to solve various engineering problems in addition with R studio.
CO4	Understand the concept of interpolation in both cases of equal and unequal intervals.
CO5	Identify various methods to perform numerical differentiation and integration.

COURSE CODE: 19FT4001 COURSE NAME: UNIT OPERATIONS LABORATORY	
CO1	Evaluate the process/performance parameters for mass transfer operations (distillation column, leaching)
CO2	Determine diffusivity and Stefan Boltzman constant using fundamental principles
CO3	Calculate the individual and overall heat transfer coefficient of heat exchangers
CO4	Determine the discharge coefficient using variable area flow meters and variable head flow meters
CO5	Assess the flow of fluids through closed conduits, open channels, valves and pipe fitting

COURSE CODE: 19FT4002 COURSE NAME: FOOD PROCESS EQUIPMENT DESIGN LABORATORY	
CO1	Adapt symbols in plant layout and design
CO2	Design pipes, process vessels and supports
CO3	Design heat transfer equipments and dryers
CO4	Apply and design different drying equipments for food products
CO5	Understand, apply and design conveying equipments to transfer agriculture produce

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COURSE CODE: 19AC4191 COURSE NAME: ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	
CO1	Ability to understand the structure of Indian system of life.
CO2	Connect up and explain basics of Indian Traditional knowledge in modern scientific perspective.
CO3	Understanding the holistic life style of yoga.
CO4	Understanding the tradition of philosophy.
CO5	Understanding the Indian linguistic and artistic tradition.

COURSE CODE: 19HE4072 COURSE NAME: CAREER GUIDANCE LEVEL IV	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

COURSE CODE: 19HE4073 COURSE NAME: IDEATION SKILLS	
CO1	Develop a strong understanding and importance of ideation
CO2	Learn about the different kinds of tools for Ideation.
CO3	Learn the need and significance of prototyping and its significance.

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COURSE OUTCOMES (COs)

SEMESTER V

COURSE CODE: 19FT5201 COURSE NAME: BAKING AND CONFECTIONERY TECHNOLOGY	
CO1	Apply the principles of baking and analyze the role of ingredients in baking
CO2	Illustrate and analyze the processing parameters of baking machineries
CO3	Understand the processing of bread and applying on the production process
CO4	Understand the role of ingredients in bakery products
CO5	Apply the production process for different types of confectionery products

COURSE CODE: 19FT5202 COURSE NAME: FOOD ADDITIVES	
CO1	To understand the principles of chemical preservation of foods
CO2	To understand the role of different food additives in the processing of different foods

CO3	To know the specific functions of different food additives in improving the shelf life, quality, texture and other physical and sensory characteristics of foods
CO4	To expose the different food additives in improving the physical and sensory characteristics of foods
CO5	To know the regulations and the monitoring agencies involved in controlling the safer use of additives in foods

COURSE CODE: 19FT5203 **COURSE NAME: POULTRY, MEAT AND FISH PROCESS TECHNOLOGY**	
CO1	Understand the process parameters of poultry processing
CO2	Understand the structure and processing of egg
CO3	Understand the processing of meat and meat products
CO4	Apply the different processing and preservation operations of fish
CO5	Understand and apply safety measures and hygienic conditions

COURSE CODE: 19FT5204 **COURSE NAME: PRINCIPLES OF FOOD PROCESSING**	
CO1	Apply different methods of high and low temperature processing techniques over raw foods and analyze the process time of that food properties of food
CO2	Understand and apply the suitable dryers to different food to increase the shelf life and analyse the performance of the evaporators and their features.
CO3	Analyze the shelf life of foods processed and preserved by natural and chemical agents.
CO4	Understand the operations and features of different non-thermal processing techniques and applying to improve the shelf life of product.
CO5	Apply the principle of advanced novel techniques in food processing industries.

COURSE CODE: 19FT5205 **COURSE NAME: UNIT OPERATIONS IN FOOD PROCESSING**	
CO1	Understand and apply the size reduction techniques to convert solids and liquids into uniform particles
CO2	Understand and apply the mechanical separation process like sedimentation, centrifugation, and filtration to separate solids, liquids and gas in food processing
CO3	Understanding the mechanism of crystallization process and applying the principles of crystallization for the production of crystals
CO4	Applying mixing equipment for the uniform mixing of solids, semi solids and liquids
CO5	Apply the extrusion process for the preparation of extruded products and its texture analysis and understanding the material handling process with its application.

COURSE CODE: 19FT5001

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COURSE NAME: BAKING AND CONFECTIONERY TECHNOLOGY LABORATORY	
CO1	Understand the processing of baking and confectionery products
CO2	Understand the properties of the flour
CO3	Understand the dough raising capacity using leavening agent
CO4	Understand the quality parameters of the bakery products
CO5	Understand the quality parameters of the confectionery products

COURSE CODE: 19FT5002 COURSE NAME: UNIT OPERATIONS IN FOOD PROCESSING LABORATORY	
CO1	Understand the Engineering mechanisms of equipment and properties of foods
CO2	Understand the separation and collection efficiency in different separators.
CO3	Apply various mills for the size reduction of food materials into different sizes.
CO4	Analyze the performance of different mills and distillation equipment.
CO5	Analyze the conveying efficiency of screw conveyors and bucket elevators for designing equipment.

COURSE CODE: 19HE5071 COURSE NAME: SOFT SKILLS - I	
CO1	Students will have clarity on their career exploration process and to match their skills and interests with a chosen career path.
CO2	Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others
CO3	Students will understand how teamwork can support leadership skills
CO4	Students will be able to make sense of problems, develop strategies to find solutions, and persevere in solving them.
CO5	Students will demonstrate an enhanced ability to draw logical conclusions and implications to solve logical problems.

COURSE CODE: 19HE5072 COURSE NAME: DESIGN THINKING	
CO1	Develop a strong understanding of the Design Process
CO2	Learn to develop and test innovative ideas through a rapid iteration cycle
CO3	Develop teamwork and leadership skills
CO4	Analyze the difference between teamwork versus individual work
CO5	Understand the concept and process of design expertise and intelligence

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COURSE OUTCOMES (COs)

SEMESTER VI

COURSE CODE: 19FT6201 COURSE NAME: DAIRY ENGINEERING	
CO1	Develop a strong understanding of the Design Process
CO2	Learn to develop and test innovative ideas through a rapid iteration cycle
CO3	Develop teamwork and leadership skills
CO4	Analyze the difference between teamwork versus individual work
CO5	Understand the concept and process of design expertise and intelligence

COURSE CODE: 19FT6202 COURSE NAME: PLANTATION CROPS AND SPICES PRODUCTS TECHNOLOGY	
CO1	Develop a strong understanding of the Design Process
CO2	Learn to develop and test innovative ideas through a rapid iteration cycle
CO3	Develop teamwork and leadership skills
CO4	Analyze the difference between teamwork versus individual work
CO5	Understand the concept and process of design expertise and intelligence

COURSE CODE: 19FT6203 COURSE NAME: FRUITS AND VEGETABLE PROCESSING TECHNOLOGY	
CO1	Understand the agricultural aspects of fruits and vegetables
CO2	Understand the nature of fresh fruits and vegetables
CO3	Remember the concepts of freezing and dehydration
CO4	Understand the processing of canning
CO5	Understand the processing of fruits and vegetable products

COURSE CODE: 19FT6181 COURSE NAME: PROFESSIONAL ETHICS IN ENGINEERING	
CO1	Understand the human values
CO2	Understand the Engineering Ethics
CO3	Understand and relate engineering and social experimentation
CO4	Remember the responsibilities
CO5	Understand the ethical global issues

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COURSE CODE: 19FT6001 COURSE NAME: DAIRY ENGINEERING LABORATORY	
CO1	Analyze the presence of macro components in milk and detect the adulterants in milk
CO2	Find the pasteurization efficiency of milk using different methods of pasteurization
CO3	Demonstrate the construction details and milk flow pattern of plate heat exchanger
CO4	Evaluate the efficiency of various equipment for the processing of milk
CO5	Determine the drying efficiency of different dryers for the production of milk powder

COURSE CODE: 19FT6002 COURSE NAME: FRUITS AND VEGETABLE PROCESSING LABORATORY	
CO1	Understand the knowledge on extraction, pulping, dehydration and prepare fruit/vegetable-based products
CO2	Impart knowledge on value addition of food products
CO3	Demonstrate methods to prevent or reduce deterioration and loss of nutritional quality of vegetables and fruits
CO4	Implement dehydration methods to produce dehydrated fruits and vegetables
CO5	Demonstrate the production of fermented products like pickles, sauerkraut from fruits and vegetables

COURSE CODE: 19HE6071 COURSE NAME: SOFT SKILL-II	
CO1	Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict
CO2	Students will Actively participate meetings, Group Discussions / interviews and prepare & deliver presentations
CO3	Students will define professional behavior and suggest standards for appearance, actions and attitude in a business environment
CO4	Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems
CO5	Students will excel in complex reasoning

COURSE CODE: 19HE6072 COURSE NAME: INTELLECTUAL PROPERTY RIGHTS (IPR)	
CO1	Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.
CO2	Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.
CO3	Identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing.
CO4	Identify different types of trademarks and procedure for registration.

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CO5	Recognize the concept of design, geographical indication and procedure for registration.

PROFESSIONAL ELECTIVE

COURSE CODE: 19FT5301 COURSE NAME: TECHNOLOGY OF FATS AND OIL	
CO1	Understand the physical and chemical properties of fats and oils
CO2	Remember the mechanical methods for oil extraction
CO3	Understand the solvent extraction and refining of oils
CO4	Understand and develop edible oil, fat products and modified oil
CO5	Understand and choose an appropriate package and storage for oils

COURSE CODE: 19FT5302 COURSE NAME: FOOD STORAGE AND INFESTATION CONTROL	
CO1	Remember and identify possible sources of pest infestation in storage
CO2	Understand and interpret ecology of region specific insects and its impact on storage
CO3	Understand and recommend appropriate storage structures and preventive measures for pests
CO4	Understand and elect integrated pest management approach and curative measures in grain storage
CO5	Understand the suitable quality control techniques in grain storage

COURSE CODE: 19FT5303 COURSE NAME: REFRIGERATION AND COLD CHAIN MANAGEMENT	
CO1	Understand the basics of refrigeration with thermodynamic principles and Carnot cycle
CO2	Understand the concept of refrigeration cycles
CO3	Remember the various components of refrigeration system and its types
CO4	Understand the concept of low temperature storage systems for foods
CO5	Understand and apply cold chain and refrigeration for food products

COURSE CODE: 19FT5304 COURSE NAME: POST HARVEST TECHNOLOGY	
CO1	Understand the concepts and processing of cereals and pulses
CO2	Remember the insight and reduce fruit and vegetable losses during processing after harvesting
CO3	Understand the specific processing technologies used especially for oil seeds, nuts and sugars
CO4	Understand the post-harvest processing of milk and milk products
CO5	Remember the meat, fish and poultry processing technologies

COURSE CODE: 19FT5305 COURSE NAME: CANE SUGAR TECHNOLOGY	
CO1	Remember the sugar cane constituents and apply preprocessing operations

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CO2	Understand the suitable cane juice extraction and concentration methods
CO3	Understand the appropriate clarification methods for sugarcane juice
CO4	Remember crystallization and refining techniques
CO5	Understand the knowledge for manufacturing of cane sugar by-products

COURSE CODE: 19FT5306 COURSE NAME: MILLING TECHNOLOGY FOR FOOD GRAINS	
CO1	Understand the structure and storage of grains
CO2	Remember the processing of paddy
CO3	Remember the processing of wheat
CO4	Understand the importance of milling of pulses
CO5	Understand the milling process of oil seeds

COURSE CODE: 19FT6301 COURSE NAME: BEVERAGE TECHNOLOGY	
CO1	Understand the role of ingredients used in beverage processing
CO2	Understand the processing of beer and wine processing
CO3	Understand the procedure of carbonated beverages
CO4	Understand the procedure of non-carbonated beverages
CO5	Understand the steps for quality control

COURSE CODE: 19FT6302 COURSE NAME: TECHNOLOGY OF SNACKS AND EXTRUDED FOODS	
CO1	Understand the preprocessing operations
CO2	Understand the mechanism behind extrusion
CO3	Understand the concepts of extruded foods
CO4	Understand the preparation of corn, rice and paddy products
CO5	Understand the heath aspects of organic foods

COURSE CODE: 19FT6303 COURSE NAME: FOOD BIOTECHNOLOGY	
CO1	Understand the introduction to biotechnology
CO2	Remember the concepts of microbial genetics
CO3	Understand the production of primary and secondary metabolites
CO4	Remember the operations behind downstream processing
CO5	Understand the application of biotechnology to traditional fermented foods

COURSE CODE: 19FT6304 COURSE NAME: BIOPROCESS ENGINEERING	
CO1	Understand the enzymes concept
CO2	Understand the microbial stains
CO3	Understand the stoichiometry of cell growth
CO4	Understand the process of fermentation
CO5	Understand the knowledge for reactor

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COURSE CODE: 19FT6305 COURSE NAME: ENZYME TECHNOLOGY	
CO1	Understand the enzyme structure and nomenclature
CO2	Remember the importance of enzyme in foods
CO3	Understand the application of enzyme in food industries
CO4	Understand the appropriate staining techniques
CO5	Understand the cell production mechanism

COURSE CODE: 19FT6306 COURSE NAME: CROP PROCESS ENGINEERING	
CO1	Demonstrate different engineering properties of grains and the method to determine moisture content
CO2	Select suitable equipment for threshing, cleaning and drying of grains and oilseeds
CO3	Summarize the operations involved in rice and pulse processing
CO4	Apply the knowledge on the various storage methods to minimize the loss and extend the shelf life of the grains
CO5	Use different ways to utilize the waste into useful by products and value-added products

OPEN ELECTIVE

COURSE CODE: 19FT6401 COURSE NAME: TRADITIONAL FOODS	
CO1	Justify the processing methods of traditional foods in terms of its health benefits
CO2	Assess the production methods of traditional sweets, snacks and dairy products
CO3	Differentiate Traditional fermented foods products based on its raw material
CO4	Implement a large-scale production of tradition foods for its increased consumption
CO5	Compare the health aspects of traditional foods with modern foods

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COURSE OUTCOMES (COs)

SEMESTER VII

COURSE CODE: 16HE7101 COURSE NAME: PROFESSIONAL ETHICS

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CO1	The students will understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories
CO2	The students will understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field
CO3	The students will be aware of responsibilities of an engineer for safety and risk benefit analysis.
CO4	The students will be aware of professional rights and responsibilities of an engineer
CO5	The students will acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives

COURSE CODE: 16FT7201 COURSE NAME: FOOD ADDITIVES	
CO1	Understand the need of food additives and preservatives
CO2	Understand the importance of acidity regulators and preservatives
CO3	Understand the role of emulsifiers, stabilizers and thickeners
CO4	Understand the antioxidants and anticaking agents
CO5	Understand about colours and sweeteners

COURSE CODE: 16FT7202 COURSE NAME: PLANTATION CROPS & SPICES PRODUCT TECHNOLOGY	
CO1	Remember the steps involved in processing of plantation crops
CO2	Understand the processing of tea and coffee
CO3	Understand the appropriate techniques for processing of spices
CO4	Understand the use of food processing operations in the processing of tuber crops
CO5	Understand the biosynthesis of flavors

COURSE CODE: 16FT7001 COURSE NAME: FOOD PROCESS EQUIPMENT DESIGN LABORATORY	
CO1	Draw the front view, back view and side view of the equipment used in food industry
CO2	Analyze the process parameters of equipment and design pressure vessels, storage tanks and pulper
CO3	Select the suitable products and materials for designing heat exchangers and evaporator
CO4	Design and analyze the performance of dryers and extruders
CO5	Analyze and determine the parameter for designing size reduction and conveying equipment

PROFESSIONAL ELECTIVES

COURSE CODE: 16FT7301

COURSE NAME: BIOLOGY AND CHEMISTRY OF FOOD FLAVOURS	
CO1	Understand the problems in flavor research
CO2	Understand the compounds responsible for flavours
CO3	Understand the chemical senses
CO4	Understand the flavor analysis procedures
CO5	Understand the flavor concepts and applications

COURSE CODE: 16FT7302 COURSE NAME: FOOD LAWS AND SAFETY	
CO1	Understand the safety during processing
CO2	Understand the key safety principles
CO3	Understand the manufacturing practices
CO4	Understand the need of food laws
CO5	Understand the management systems

COURSE CODE: 16FT7303 COURSE NAME: FUNCTIONAL FOODS AND NUTRACEUTICALS	
CO1	Understand the significance of functional foods and nutraceuticals
CO2	Understand the analysis oh phytochemicals
CO3	Understand the procedures for assessing antioxidant activity
CO4	Understand the role of nutraceuticals in health and disease
CO5	Understand the safety issues

COURSE CODE: 16FT7304 COURSE NAME: FOOD TOXICOLOGY AND ALLERGY	
CO1	Understand the concepts of food toxicology
CO2	Understand the reactions of natural toxins
CO3	Remember the toxicants during food processing
CO4	Understand the procedures of sampling
CO5	Understand the instrumentation techniques to detect toxins

COURSE CODE: 16FT7305 COURSE NAME: INSTRUMENTATION AND PROCESS CONTROL	
CO1	Understand the use of Laplace transformation for first order control systems
CO2	Understand the Laplace transformation for second order control systems and determine its dynamic response
CO3	Understand the concepts of feedback controller, its dynamic response and automation
CO4	Understand the stability criteria for various controllers
CO5	Understand the temperature and pressure measuring instruments

COURSE CODE: 16FT7306 COURSE NAME: TECHNOLOGY OF SNACK AND EXTRUDED FOODS	
CO1	Understand and choose the appropriate ingredient based on their functionality
CO2	Understand the production of potato and rice based snacks

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CO3	Remember the suitable techniques for corn based snacks production
CO4	Understand the production of extruded snack foods
CO5	Understand the categorization and formulation of pasta products

COURSE CODE: 16FT7307 COURSE NAME: BEVERAGE TECHNOLOGY	
CO1	Understand the role of ingredients used in beverage processing
CO2	Understand the processing of beer and wine processing
CO3	Understand the procedure of carbonated beverages
CO4	Understand the procedure of non-carbonated beverages
CO5	Understand the steps for quality control

COURSE CODE: 16FT7308 COURSE NAME: FOOD PROCESS PLANT LAYOUT AND SAFETY	
CO1	Understand and design the plant layout
CO2	Understand the different industrial hazards
CO3	Remember the industrial safety performance and safety procedures
CO4	Remember the acquired knowledge for prevention of industrial accidents
CO5	Understand the health hazards and legal aspects in industries

COURSE CODE: 16FT8301 COURSE NAME: DRYING TECHNOLOGY	
CO1	Understand the mechanism and quality changes during drying
CO2	Understand the suitable dryers for food products based on requirement
CO3	Understand and identify appropriate low cost drying methods
CO4	Understand and choose suitable dryers for solid food materials
CO5	Understand and recommend appropriate dryers for liquid food materials

COURSE CODE: 16FT8302 COURSE NAME: EMERGING TECHNOLOGIES IN FOOD PROCESSING	
CO1	Understand the concepts and effects of high pressure processing
CO2	Understand the experiment with pulsed electric field and pulsed light technology for foods
CO3	Understand and adapt ultrasound and ozone techniques for foods
CO4	Understand and apply ohmic heating principle in food processing
CO5	Understand the novel drying techniques and adapt automation in food processing

COURSE CODE: 16FT8303 COURSE NAME: MODELLING, SIMULATION AND SOFT TOOLS FOR FOOD TECHNOLOGISTS	
CO1	Remember the concepts of modeling in food processing
CO2	Understand the suitable mathematical models in fermentation and MAP

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CO3	Understand the modeling concepts in cooling and freezing processes of foods
CO4	Understand the models used in thermal processing of foods
CO5	Understand the use of appropriate software for modeling processes

COURSE CODE: 16FT8304 COURSE NAME: ANALYTICAL INSTRUMENTS IN FOOD INDUSTRIES	
CO1	Understand the application of UV-Visible and IR spectroscopy in food analysis
CO2	Understand and make use of AAS, NMR and thermal methods to analyze different food materials
CO3	Understand and apply X- ray diffraction, flame photometers and Polarimetry in food analysis
CO4	Remember and recognize the usage of conductance and potential measurements for analysis of components
CO5	Understand and infer the chromatographic principles to separate and analyze materials

COURSE CODE: 16FT8305 COURSE NAME: SEPARATION TECHNIQUES IN FOOD PROCESSING	
CO1	Understand the concepts of separation and filtration techniques
CO2	Understand and select the suitable membrane process and cleaning techniques
CO3	Understand the classification of adsorption techniques
CO4	Understand the concepts of ionic separation and permeation
CO5	Understand and elaborate other separation processes and effluent treatment

COURSE CODE: 16FT8306 COURSE NAME: WASTE MANAGEMENT AND BY-PRODUCT UTILIZATION IN FOOD INDUSTRIES	
CO1	Understand the classification of food waste and recommend the strategies for waste minimization
CO2	Understand and identify the method for treatment of liquid and solid waste
CO3	Understand and utilize residues from oil seed and tuber processing industries
CO4	Understand the by-product production from animal product based industries
CO5	Understand and develop by-products from grain, fruits and vegetables processing

COURSE CODE: 16FT8307 COURSE NAME: ECONOMICS AND MANAGEMENT	
CO1	Understand the capital cost and the value of money for the complete plant

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CO2	Understand the profitability of the project and balance sheet preparation
CO3	Understand the economic operation of the equipment
CO4	Understand the planning and management
CO5	Understand the production planning, control chart preparation and quality control

COURSE CODE: 16FT8308 COURSE NAME: EMERGING NON-THERMAL PROCESSING OF FOOD	
CO1	Understand the concepts of non-thermal processing
CO2	Understand the non-thermal packaging techniques
CO3	Understand the minimal processing steps
CO4	Understand the technology of membranes
CO5	Understand the recent advancement in food preservation

OPEN ELECTIVE

COURSE CODE: 16FT7401 COURSE NAME: FOOD PRODUCT DEVELOPMENT	
CO1	Remember the concepts for technological innovation
CO2	Understand the selection and evaluation process
CO3	Understand the planning steps
CO4	Understand the steps for developing a new product
CO5	Understand the model for development

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	CHEMICAL ENGINEERING
PROGRAMME NAME	CHEMICAL ENGINEERING
REGULATIONS	2019, 2020, 2021

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO 1	Participate as leaders in their fields of expertise and in activities that support service and economic development nationally and throughout the world.
PEO 2	Pursue continued life-long learning through professional practice, research and training programs in the field of chemical engineering and science.
PEO 3	Solve real-life problems in a broad perspective to fulfill ethical, economic, environmental and social responsibilities.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

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 modeling to complex engineering activities with an understanding

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	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.
PO 11	**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.
PO 12	**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.

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COURSE OUTCOMES (COs)

PROGRAM NAME: CHEMICAL ENGINEERING

Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSE CODE: 21HE1101 COURSE NAME: TECHNICAL ENGLISH	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	Acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSECODE: 21MA1102 COURSE NAME: CALCULUS AND LINEAR ALGEBRA	
CO1	Apply the concept of differentiation in any curve.
CO2	Identify the maximum and minimum values of surfaces.
CO3	Apply double integrals to computearea of plane curves.
CO4	Evaluation of triple integrals to compute volume of solids.
CO5	Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies (or Eigen frequencies) of vibration and the shapes of these vibrational modes.

COURSE CODE: 21PH1151 COURSE NAME: APPLIED PHYSICS	
CO1	Illustrate the fundamental properties of matter
CO2	Discuss the Oscillatory motions of particles
CO3	Analyze the wavelength of different colors
CO4	Understand the advanced technology of LASER in the field of Engineering
CO5	Develop the technology of fiber optical communication in engineering field

COURSECODE: 21CY1151 COURSE NAME: CHEMISTRY FOR ENGINEERS	
CO1	Differentiate hard and soft water and to solve the related problems on water purification and its significance in industries and daily life
CO2	Acquire the basic knowledge of polymers, composites and FRP and

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	their significance.
CO3	Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences to minimize corrosion to improve industrial design.
CO4	Develop knowledge about the renewable energy resources and batteries along with the need of new materials to improve energy storage capabilities
CO5	Identify the structure and characteristics of unknown/new compound with the help of spectroscopy.

COURSE CODE:21CS1151 **COURSE NAME: PYTHON PROGRAMMING AND PRACTICES**	
CO1	Develop algorithmic solutions to simple computational problems
CO2	Read, write, execute by hand simple Python programs
CO3	Structure simple Python programs for solving problems and decompose a Python program into functions.
CO4	Represent compound data using Python lists, tuples, dictionaries.
CO5	Read and write data from/to files in Python Programs

COURSECODE:21ME1152 **COURSE NAME: ENGINEERING DRAWING**	
CO1	Understand and interpret the engineering drawings in order to visualize the objects and draw the conics and special curves
CO2	Draw the orthogonal projections of straight lines and planes
CO3	Interpret the projections of simple solid objects in plan and elevation
CO4	Draw the projections of section of solids and development of surfaces of solids.
CO5	Draw the isometric projections and the perspective views of different objects.

COURSE CODE:21HE1001 **COURSE NAME: LANGUAGE COMPETENCY ENHANCEMENT COURSE-I**	
CO1	Trained to maintain coherence and communicate effectively
CO2	Practiced to create and interpret descriptive communication
CO3	Introduced to gain information of the professional world
CO4	Acquired various types of communication and etiquette
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE:21HE1072 **COURSE NAME: CAREER GUIDANCE LEVEL - I**	
CO1	Enable students to approach learning Aptitude with ease, and understand recruiter expectation.

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COURSE OUTCOMES (COs)

SEMESTER II

COURSECODE:21HE1901 COURSE NAME: BUSINESS ENGLISH FOR ENGINEERS	
CO1	To know different modes of business communication
CO2	To understand managerial techniques
CO3	To apply the rules of grammar and vocabulary in effective business communication.
CO4	To analyse and interpret business documents
CO5	To draft business reports

COURSE CODE:21MA1901 COURSE NAME: DIFFERENTIAL EQUATIONS AND COMPLEX	
CO1	Apply few methods to solve different types of first order differential equations
CO2	Develop sound knowledge of techniques in solving ordinary differential equations
CO3	Solve Partial Differential Equations using various methods.
CO4	Infer the knowledge of construction of analytic functions and conformal mapping
CO5	Evaluate real and complex integrals over suitable closed paths or contours.

COURSECODE:21EE1901 COURSE NAME:BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	
CO1	Apply the KVL and KCL in Electrical circuits.
CO2	Explain the constructional features of AC and DC machines.
CO3	Develop awareness on the methods for electrical safety, load protection basics.
CO4	Identify electronics components and use of them to design circuits.
CO5	Develop Combinational and Sequential logic circuits.

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COURSE CODE: 21CH1901 COURSE NAME: PRINCIPLES OF CHEMICAL ENGINEERING	
CO1	Understand the role of chemical engineers.
CO2	Understand the scientific and governing laws in chemical engineering.
CO3	Understand about the various chemical reactionsin the processes.
CO4	Understand the measurement of quantities and energy in process.
CO5	Understand the demand of chemical engineers, opportunities and future.

COURSE CODE: 21PH1951 COURSE NAME:MATERIAL SCIENCE	
CO1	Understand the purpose of acceptor or donor levels and the band gap of a semiconductor
CO2	Interpret the basic idea behind the process of magnetism and its applications in everyday
CO3	Discuss the behavior of super conducting materials
CO4	Illustrate the types and importance of crystal systems
CO5	Evaluate the production of ultrasonics and its applications in NDT

COURSE CODE: 21CY1951 COURSE NAME: ENVIRONMENTAL STUDIES	
CO1	Realise the importance of ecosystem and biodiversity for maintaining ecological balance.
CO2	Understand the causes of environmental pollution and hazards due to manmade activities.
CO3	Develop an understanding of different natural resources including renewable resources.
CO4	Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues.
CO5	Gain knowledge about the importance of women and child education and know about the existing technology to protect environment

COURSE CODE: 21ME2001 COURSE NAME: ENGINEERING PRACTICES	
CO1	Fabricate wooden components and pipe connections including plumbing works
CO2	Fabricate simple weld joints
CO3	Fabricate different electrical wiring circuits and understand the AC Circuits.

COURSE CODE: 21HE2001 COURSE NAME: LANGUAGE COMPETENCY ENHANCEMENT COURSE- II	
CO1	Introduced to different modes and types of business communication
CO2	Practiced to face and react to various professional situations efficiently
CO3	learnt to practice managerial skills.
CO4	Familiarized with proper guidance to business writing
CO5	Trained to analyze and respond to different types of communication.

COURSE CODE: 21HE2072 COURSE NAME: CAREER GUIDANCE LEVEL - II	
CO1	Enable students to solve questions on Verbal, Logical and Quantitative Aptitude of placement level

COURSE CODE:21HE1073 COURSE NAME:ENTREPRENEURSHIP & INNOVATION	
CO1	Understand the nature of business opportunities, resources, and industries in critical and creative aspects.
CO2	Understand the processes by which innovation is fostered, managed, and commercialized.
CO3	Remember effectively and efficiently the potential of new business opportunities
CO4	Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness.
CO5	Develop a business model for a new venture, including revenue. Margins, operations, working capital,and investment

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SEMESTER III

COURSE CODE:19MA3103 COURSE NAME:FOURIER ANALYSIS AND NUMERICAL METHODS	
CO1	Understand the function in terms of sine and cosine terms in fourier series and also to getknowledge in fourier transforms.
CO2	Demonstrate the application of Fourier series in solving the heat and wave equations.
CO3	Understand the mathematical principles on Fourier transforms and

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	able to solve some of the Physical problems of engineering.
CO4	Understand and apply the concepts of interpolation, numerical differentiation andintegration.
CO5	Understand the concept of solving ordinary differential equations using single and multi step methods

COURSE CODE:19CH3201 COURSE NAME:CHEMICAL PROCESS CALCULATIONS	
CO1	Remember the units, unit's conversion and degrees of freedom.
CO2	Understand the reactor systems and perform material and energy balances for process flowsheets by applying degree of freedom.
CO3	Remember the calculations associated with gases in two phase systems, in combustion processes.
CO4	Understand energy balance and heat capacity calculations.
CO5	Understand about the simulation of steady-state and unsteady state processes using process simulators.

COURSE CODE:19CH3202 COURSE NAME: FLUID MECHANICS FOR CHEMICAL ENGINEERS	
CO1	Understand the principles of fluid properties and fluid statics.
CO2	Understand the principles of fluid flow problems like pressure drop power and loss coefficient and apply the same in chemical process industries.
CO3	Understand the flow behavior of solid and liquid and to demonstrate the understanding of packed and fluidized bed.
CO4	Understand and select fluid moving machinary for different applications in process industries.
CO5	Understand and select characteristics of pumps, flow meters and valves for different applications in process industries

COURSE CODE:19CH3203 COURSE NAME: CHEMICAL ENGINEERING THERMODYNAMICS - I	
CO1	Remember the concepts of heat, work and energy.
CO2	Understand the properties and relationships of thermo dynamic fluids.
CO3	Understand the laws thermodynamics and correctly use thermodynamics terminology.
CO4	Remember the fundamental thermodynamic properties
CO5	Understand the basic thermodynamic cycles.

COURSE CODE:19CH3251 COURSE NAME: ANALYTICAL INSTRUMENTS FOR ANALYSIS	
CO1	Understand qualitative and quantitative analysis
CO2	Understand the operation and analyze the samples using UV-spectroscopy
CO3	Understand the principles of gravimetric analysis of samples
CO4	Understand about the sample analyses using gas chromatography

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CO5	Understand about the sample analyses using HPLC

COURSE CODE: 19CH3001 **COURSE NAME: FLUID MECHANICS LAB**	
CO1	Use variable area flow meters and variable head flowmeters.
CO2	Analyze the flow of fluids through closed conduits, open channels and flow past immersed bodies.
CO3	Select pumps for the transportation of fluids based on process conditions/requirements and fluid properties sly.

COURSE CODE: 19CH3002 **COURSE NAME: CHEMICAL ANALYSIS LAB**	
CO1	Develop the ability to handle and work with the equipment like viscometers, flash and fire point apparatus etc.
CO2	Understand the methods for determining COD.
CO3	Understand the few simple synthetic techniques for soap.

COURSE CODE: 19MC3191 **COURSE NAME: INDIAN CONSTITUTION**	
CO1	Understand the functions of the Indian government
CO2	Understand and abide the rules of the Indian constitution.

COURSE CODE: 19HE3072 **COURSE NAME: Career Guidance Level - III**	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays

COURSE CODE:19HE3073 **COURSE NAME: LEADERSHIP MANAGEMENT SKILLS**	
CO1	To practice essential leadership skills in day to day operations
CO2	To work on leadership skills in the study environment
CO3	To understand and develop the skills consciously.
CO4	To know about the real worth of all the skills for success
CO5	To Analyze the real worth of the person and suggestion for improvement

SEMESTER IV

COURSE CODE:19CH4201 **COURSE NAME:PROCESS HEAT TRANSFER**

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CO1	Understand the various modes of heat transfer.
CO2	Understand the concept of convective heat transfer model using dimensional analysis.
CO3	Understand the heat transfer process with phase change.
CO4	Understand the design concepts of evaporator.
CO5	Understand the design concepts of heat exchangers.

COURSE CODE:19CH4202 COURSE NAME: MASS TRANSFER - I	
CO1	Understand the diffusion process in all three phases.
CO2	Understand the concept of mass transfer coefficients and theories.
CO3	Understand the principle of Humidification operation.
CO4	Understand the classification and demonstration of dryers.
CO5	Understand the design concepts of the crystallizer.

COURSE CODE:19CH4203 COURSE NAME: CHEMICAL ENGINEERING THERMODYNAMICS - II	
CO1	Understand the property of solutions upon mixing and also about the excess property.
CO2	Understand and generate the phase diagram data and also about the effect of temperature and pressure on a zeotropic conditions.
CO3	Understand the various models used to evaluate the equilibrium data and also to test the thermo dynamic consistency.
CO4	Understand and calculate the equilibrium constant for various systems and analysis of simultaneous reactions
CO5	Understand the refrigeration process and performance.

COURSE CODE:19CH4251 COURSE NAME:MECHANICAL OPERATIONS	
CO1	Understand the general characteristics of solids, screening and sieve analysis.
CO2	Understand the particle size reduction processes and to operate the size reduction equipment
CO3	Understand the methods of particles separation
CO4	Understand the theory of filtration and filtration equipment
CO5	Understand about the particle handling and the power required for mixing.

COURSE CODE:19MA4153 COURSE NAME: APPLIED PROBABILITY STATISTICS	
CO1	Understand the concepts of random variables.
CO2	Express the phenomenon of two dimensional random variables.
CO3	Compute correlation and predict unknown values using regression.
CO4	Understand the concepts of statistical methods for testing the hypothesis.

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CO5	Apply Design of Experiment techniques to solve various engineering problems.

COURSE CODE: 19CH4001 **COURSE NAME: HEAT TRANSFER LAB**	
CO1	Understand the heat transfer calculations by conduction, convection and radiation.
CO2	Understand the heat exchanger design and structure of this equipment.
CO3	Understand the theoretical and empirical models for heat transfer calculations.
CO4	Understand the applications of heat transfer equipment in various operating process plants.

COURSE CODE: 19CH4002 **COURSE NAME: PETROCHEMICAL ANALYSIS LAB**	
CO1	Acquire knowledge through carry out experiments about physical and chemical characterization of petrochemical products and apply knowledge inindustries.
CO2	Perform the advanced qualitative and quantitative laboratory tasks, including the operation of advanced analytical instrumentation

COURSE CODE: 19MC4191 **COURSE NAME: ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE**	
CO1	Ability to understand the structure of Indian system of life.
CO2	Connect up and explain basics of Indian Traditional knowledge in modern scientific perspective

COURSE CODE: 19HE4072 **COURSE NAME: CAREER GUIDANCE LEVEL - IV**	
CO1	Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

COURSE CODE: 19HE4073 **COURSE NAME: IDEATION SKILLS**	
CO1	Develop a strong understanding and importance of ideation
CO2	Learn about the different kinds of tools for Ideation.
CO3	Learn the need and significance of prototyping and its significance

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COURSE CODE:19CH5201 COURSE NAME: CHEMICAL REACTION ENGINEERING - I	
CO1	Understand the concept of rate equation and batch reactors.
CO2	Understand the working of CSTR and PFR.
CO3	Understand the design and working of multiple reactors.
CO4	Understand the non-isothermal effect on reactors.
CO5	Understand the concept of RTD in analyzing reactor performances.

COURSE CODE:19CH5202 COURSE NAME: MASS TRANSFER - II	
CO1	Evaluate the theoretical stages, number of transfer units and height requirements for a gas absorption process
CO2	Apply the number of trays for stage wise contact and determine the height of the packed tower
CO3	Evaluate the equilibrium stages and understand the working of extractor.
CO4	Evaluate the number of stages and the working of leaching equipment.
CO5	Understand the concept of adsorption, ion exchange & membrane separation processes.

COURSE CODE: 19CH5203 COURSE NAME: PROCESS INSTRUMENTATION DYNAMICS AND CONTROL	
CO1	Understand the classification of various process instruments.
CO2	Understand the open loop systems in process control.
CO3	Understand the closed loop systems in process control.
CO4	Understand Frequency response of control systems and tune the PID controllers
CO5	Understand the advanced control schemes and to control the equipment in chemical industries.

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COURSE CODE:19CH5204 COURSE NAME: SAFETY IN CHEMICAL INDUSTRIES	
CO1	Understand the need for safety in chemical industries and operating conditions
CO2	Understand the Plant inspection, safe handling of chemicals
CO3	Understanding on risk management iso 14000, ems
CO4	Understand the hazard identification safety audits, checklist, what if analysis
CO5	Understand the vulnerability models event tree analysis fault tree analysis, hazan, hazop

COURSE CODE:19CH5251 COURSE NAME: WATER TREATMENT AND SOLID WASTE MANAGEMENT	
CO1	Remember the types of water pollutants and sources
CO2	Understand the Primary/ Secondary/Biological treatment process of waste water.
CO3	Understand the tertiary/advancedtreatment process of waste water.
CO4	Understand the sources of air and noise pollution and control techniques.
CO5	Understand the types of solid waste, sources and solid waste management techniques.

COURSE CODE: 19CH5001 COURSE NAME: MASS TRANSFER LAB	
CO1	Understand the determination of important data for the design and operation of the process equipment like distillation, extraction, diffusivity and drying principles which are having wide applications in various industries.

COURSE CODE: 19CH5002 COURSE NAME: PROCESS CONTROL LAB	
CO1	Understand the development and use of right type of control dynamics for process control under different operative conditions.

COURSE CODE: 19HE5071 COURSE NAME: SOFT SKILLS - I	
CO1	Students will have clarity on their career exploration process and to match their skills and interests with a chosen career path.
CO2	Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others
CO3	Students will understand how teamwork can support leadership skills
CO4	Students will be able to make sense of problems, develop strategies to find solutions, and persevere in solving them.
CO5	Students will demonstrate an enhanced ability to draw logical conclusions and implications to solve logical problems.
COURSE CODE:19HE5072	

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COURSE NAME:DESIGN THINKING	
CO1	Develop a strong understanding of the Design Process
CO2	Learn to develop and test innovative ideas through a rapid iteration cycle.
CO3	Develop teamwork and leadership skills

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SEMESTER VI

COURSE CODE:19CH6201 COURSE NAME: CHEMICAL REACTION ENGINEERING– II	
CO1	Understand the nature, preparation and required properties of catalyst.
CO2	Apply the rate and isotherms studies of heterogeneous reactors.
CO3	Analyze the heat and mass transfer in gas-solid catalytic reactors.
CO4	Evaluate the rate kinetics and controlling steps in gas-solid non-catalytic reactors.
CO5	Understand the mass transfer effects on gas-liquid reactors.

COURSE CODE: 19CH6202 COURSE NAME:CHEMICAL PROCESS INDUSTRIES	
CO1	Understand the various unit operations, chemical reactions involved in the production process of sulfur, sulfuric acid and cement.
CO2	Understand the various unit operations, chemical reactions involved in the production process of fertilizers and its major components.
CO3	Understand the various unit operations, chemical reactions involved in the production process of pulp, paper, sugar and starch.
CO4	Understand the various unit operations, chemical reactions involved in the production process of petroleum and petro chemical products.
CO5	Understand the various unit operations, chemical reactions involved in the production process of fuel and industrial gases.

COURSE CODE:19CH6181 COURSE NAME:PROFESSIONAL ETHICS IN ENGINEERING	
CO1	Understand the importance of human values in the society
CO2	Understand the ethics in engineering and its theories.
CO3	Understand how the engineers are experimenters in the society.

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CO4	Understand the safety, risk assessment and intellectual property rights.
COURSE CODE:19HE6072 COURSE NAME: INTELLECTUAL PROPERTY RIGHTS (IPR)	
CO1	Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.
CO2	Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.
CO3	Identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing.
CO4	Identify different types of trademarks and procedure for registration
CO5	Recognize the concept of design, geographical indication and procedure for registration
COURSE CODE: 19CH6251 COURSE NAME: FLUIDIZATION ENGINEERING	
CO1	Understand the properties and basics of fluidization.
CO2	Understand the different types of fluidized beds based on different fluidization conditions.
CO3	Understand the various design aspects of fluidized bed systems.
CO4	Understand the effects of heat and mass transfer in fluidized beds.
CO5	Understand the other types of fluidization for collection of fines.

COURSE CODE: 19CH6001 COURSE NAME: CHEMICAL REACTION ENGINEERING LAB	
CO1	Get a sound working knowledge on different types of reactors

COURSE CODE:19HE6071 COURSE NAME: SOFT SKILL-II	
CO1	Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict.
CO2	Students will Actively participate meetings, Group Discussions / interviews and prepare & deliverpresentations
CO3	Students will define professional behavior and suggest standards for appearance, actions and attitude in a Business environment
CO4	Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.
CO5	Students will excel in complex reasoning.

PROFESSIONAL ELECTIVE – I

COURSE CODE: 19CH5301 COURSE NAME: ENERGY TECHNOLOGY	
CO1	Understand about the energy and its classification
CO2	Understand about the conventional energy resources and its production
CO3	Understand about non-conventional energy resources and its production
CO4	Understand about production of biomass energy
CO5	Understand about the energy conservation and management

COURSE CODE: 19CH5302 COURSE NAME: PETROLEUM TECHNOLOGY	
CO1	Understand the basic refinery products by unit operation and process
CO2	Understand about the process of catalytic cracking and hydro treating for the production of petroleum products
CO3	Understand about the catalytical process of petroleum products production
CO4	Understand about the lubrication of petroleum feed stock
CO5	Understand the cost evaluation process in petroleum refineries

COURSE CODE: 19CH5303 COURSE NAME: ELECTROCHEMICAL ENGINEERING	
CO1	Understand the basic electrochemistry
CO2	Understand the diffusion transfer in electrochemical systems
CO3	Understand the corrosion formation and control measures
CO4	Understand the process of electro plating and fuel cells
CO5	Understand the various types of electrodes in electrochemical industries

COURSE CODE: 19CH5304 COURSE NAME: POLYMER TECHNOLOGY	
CO1	Understand about the various macromolecules and its difference with organic molecules
CO2	Understand about the initiation of addition polymerization and its types
CO3	Understand about condensation polymerization reaction for polymer synthesis
CO4	Understand the molecular distribution and the methods of determination
CO5	Understand the transition in polymers and crystallization process

COURSE CODE: 19CH5305 COURSE NAME: FOOD TECHNOLOGY	
CO1	Understand the basic and general aspects of food industry

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CO2	Understand the quality standards and control of food constituents
CO3	Understand the preliminary and general methods of food processing
CO4	Understand about the different food preservation methods
CO5	Understand about the production of different food products and utilization

PROFESSIONAL ELECTIVE - II

COURSE CODE: 19CH6301 COURSE NAME: PETROLEUM EXPLORATION AND EXPLOITATION TECHNIQUES	
CO1	Understand the origin and occurrence of petroleum
CO2	Understand the various exploration methods and economic analysis of exploration
CO3	Understand the process of various logging based on various geological structure
CO4	Understand the process of drilling for well completion and different stimulation methods
CO5	Understand the process various off-shore technology oil recovery techniques

COURSE CODE: 19CH6302 COURSE NAME: ENZYME ENGINEERING	
CO1	Understand the types and structure of different microbial cells, its isolation, purification of enzymes and immobilizing both
CO2	Understand the fermentation operation and its kinetics
CO3	Understand the mixing, oxygen transfer methodology into the cells and power requirement for the design of bioreactor
CO4	Understand the basic biochemistry related to enzymes, its assay techniques and enzyme applications
CO5	Understand the design of bioreactors under batch, continuous mode by the use of isolated enzymes

COURSE CODE: 19CH6303 COURSE NAME: FUNDAMENTALS OF NANO SCIENCE	
CO1	Understand the concept of nanoscience, implications of science and mathematics and the fundamental properties
CO2	Understand the process of nanoparticle preparation methods in general
CO3	Understand about the various nanomaterials preparation, its properties and applications
CO4	Understand about the various characterization techniques for the identification of nano size and structure
CO5	Understand the application of nanotechnology in various fields

COURSE CODE: 19CH6304 COURSE NAME: CORROSION SCIENCE AND ENGINEERING	
CO1	Understand about corrosion and its forms

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CO2	Understand about Protect boiler against corrosion
CO3	Understand various corrosion test and its ASTM standards
CO4	Understand the Polarization and Effect of oxidizing agents on corrosion
CO5	Understand the Corrosion prevention methods and its applications.

COURSE CODE: 19CH6305 **COURSE NAME: PIPING AND INSTRUMENTATION**	
CO1	Understand about the basic piping engineering, its standards and installations
CO2	Understand the drawing, sizing and hydraulics study of pipe
CO3	Understand about the development of pipe layout, plot plan and equipment layout and its dynamic analysis
CO4	Understand about the different types of piping support for various requirements
CO5	Understand about the process and instrumentation diagram and cost elements

COURSE CODE: 19CH6401 **COURSE NAME: WASTE TO ENERGY CONVERSION**	
CO1	Understand to characterize the waste
CO2	Understand about the pyrolysis and gasification process for energy production.
CO3	Understand about the process of energy production from plastics
CO4	Understand about the energy production from organic waste
CO5	Understand about the Energy production from wastes through fermentation and trans esterification

HICET	PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
PROGRAMME NAME	B.TECH
REGULATIONS	R2019

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO 1	To acquire knowledge in the latest technologies and innovations and an ability to identify, analyze and solve problems in computer engineering.
PEO 2	To be capable of modeling, designing, implementing and verifying a computing system to meet specified requirements for the benefit of society.
PEO 3	To possess critical thinking, communication skills, teamwork, leadership skills and ethical behavior necessary to function productively and professionally.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

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

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	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 modeling 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.

HICET

COURSE OUTCOMES (COs)

PROGRAM NAME – B.TECH AI & ML

Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSE CODE: 21HE1101 COURSE NAME: TECHNICAL ENGLISH	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	Acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills.

COURSE CODE: 21MA1101 COURSE NAME: CALCULUS	
CO1	Apply the concept of differentiation in any curve.
CO2	Identify the maximum and minimum values of surfaces.
CO3	Apply double integrals to compute area of plane curves.
CO4	Evaluation of triple integrals to compute volume of solids.
CO5	Evaluation of infinite series approximations for problems arising in mathematical modeling.

COURSE CODE: 21PH1151 COURSE NAME: APPLIED PHYSICS	
CO1	Illustrate the fundamental properties of matter
CO2	Discuss the Oscillatory motions of particles
CO3	Analyze the wavelength of different colors
CO4	Understand the advanced technology of LASER in the field of Engineering
CO5	Develop the technology of fiber optical communication in engineering field

COURSE CODE: 21CY1151 COURSE NAME: CHEMISTRY FOR ENGINEERS	
CO1	Differentiate hard and soft water and to solve the related problems on water purification and its significance in industries and daily life
CO2	Acquire the basic knowledge of polymers, composites and FRP and their significance.
CO3	Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences to minimize

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	corrosion to improve industrial design.
CO4	Develop knowledge about the renewable energy resources and batteries along with the need of new materials to improve energy storage capabilities.
CO5	Identify the structure and characteristics of unknown/new compound with the help of spectroscopy.

COURSE CODE: 21AI1152 **COURSE NAME: OBJECT ORIENTED PROGRAMMING USING PYTHON**	
CO1	Understanding the basic concepts to read, write and execute simple python programs.
CO2	Apply the conditional and looping concepts for solving problems
CO3	Apply functions to decompose larger complex programs
CO4	Understanding the OOPS concepts and writing programs using classes and objects
CO5	Understand to read and write data from/to files in Python Programs.

COURSE CODE: 21EC1154 **COURSE NAME: BASICS OF ELECTRON DEVICES AND ELECTRIC CIRCUITS**	
CO1	Apply network theorems for AC and DC Circuits.
CO2	Understand the concept of transient response of circuits.
CO3	Ability to explain the theory, construction, and operation of diodes and BJT.
CO4	Ability to explain the theory, construction, and operation of FET and special semiconductor diodes.
CO5	Ability to apply the methods to ensure electrical safety.

COURSE CODE: 21HE1071 **COURSE NAME: LANGUAGE COMPETENCY ENHANCEMENT COURSE - I**	
CO1	Trained to maintain coherence and communicate effectively.
CO2	Practiced to create and interpret descriptive communication.
CO3	Introduced to gain information of the professional world.
CO4	Acquired various types of communication and etiquette.
CO5	Taught to improve interpersonal and intrapersonal skills

COURSE CODE: 21HE1072 **COURSE NAME: CAREER GUIDANCE – LEVEL I**	
CO1	Students will analyze interpersonal communication skills. public speaking skills.
CO2	Students will exemplify tautology, contradiction and contingency by logical thinking
CO3	Students will be able to develop an appropriate integral form to solve all sorts of quantitative problems.
CO4	Students can produce a resume that describes their education, skills, experiences and measurable achievements with proper grammar,

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	format and brevity.
CO5	Students will be developed to acquire the ability to use English language with an error while making optimum use of grammar.

COURSE CODE: 21HE1073 **COURSE NAME: ENTREPRENEURSHIP & INNOVATION**	
CO1	Understand the nature of business opportunities, resources, and industries in critical and creative aspects.
CO2	Understand the processes by which innovation is fostered, managed, and commercialized.
CO3	Remember effectively and efficiently the potential of new business opportunities.
CO4	Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness.
CO5	Develop a business model for a new venture, including revenue. Margins, operations, working capital, and investment

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HICET

COURSE OUTCOMES (COs)

PROGRAM NAME – B.Tech AI & ML

Upon the successful completion of the course, the students will be able to

SEMESTER II

COURSE CODE : 21HE2101 **COURSE NAME: BUSINESS ENGLISH FOR ENGINEERS**	
CO1	Introduced to different modes and types of business communication.
CO2	Practiced to face and react to various professional situations efficiently.
CO3	Learnt to practice managerial skills.
CO4	Familiarized with proper guidance to business writing.
CO5	Trained to analyze and respond to different types of communication.

COURSE CODE: 21MA2104 **COURSE NAME: DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA**	
CO1	Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies
CO2	Infer the knowledge of vector spaces

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CO3	Apply few methods to solve different types of first order differential equations.
CO4	Develop sound knowledge of techniques in solving ordinary differential equations.
CO5	Solve Partial Differential Equations using various methods.

COURSE CODE: 21PH2151 COURSE NAME: MATERIAL SCIENCE	
CO1	Understand the purpose of acceptor or donor levels and the band gap of a semiconductor.
CO2	Interpret the basic idea behind the process of magnetism and its applications in everyday.
CO3	Discuss the behavior of super conducting materials.
CO4	Illustrate the types and importance of crystal systems.
CO5	Evaluate the production of ultrasonics and its applications in NDT.

COURSE CODE :21CY2151 COURSE NAME: ENVIRONMENTAL STUDIES	
CO1	Develop an understanding of different natural resources including renewable resources.
CO2	Realise the importance of ecosystem and biodiversity for maintaining ecological balance.
CO3	Understand the causes of environmental pollution and hazards due to manmade activities.
CO4	Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues.
CO5	Gain knowledge about the importance of women and child education and know about the existing technology to protect environment.

COURSE CODE : 21AI2152 COURSE NAME: JAVA FUNDAMENTALS	
CO1	Understanding the OOPS and basic concepts of Java.
CO2	Understand how to program using user defined packages and interfaces.
CO3	Apply multithreading concepts based on appropriate problems.
CO4	Understand generics and collections framework in java.
CO5	Apply event handling classes and swing concepts to create different applications in java.

COURSE CODE : 21ME2154 COURSE NAME: ENGINEERING GRAPHICS

CO1	Understand and interpret the engineering drawings in order to visualize the objects and draw the conics and special curves.
CO2	Draw the orthogonal projections of straight lines and planes.
CO3	Interpret the projections of simple solid objects in plan and elevation.
CO4	Draw the projections of section of solids and development of surfaces of solids.
CO5	Draw the isometric projections and the perspective views of different objects.

COURSE CODE : 21ME2001 COURSE NAME : ENGINEERING PRACTICES	
CO1	Fabricate wooden components and pipe connections including plumbing works.
CO2	Fabricate simple weld joints.
CO3	Fabricate different electrical wiring circuits and understand the AC Circuits.

COURSE CODE : 21HE2071R COURSE NAME : LANGUAGE COMPETENCY ENHANCEMENT COURSE - II	
CO1	Introduced to different modes and types of communication.
CO2	Practiced to face and react to various professional situations efficiently.
CO3	learnt to practice managerial skills.
CO4	Familiarized with proper guidance to writing.
CO5	Trained to analyze and respond to different types of communication

COURSE CODE : 21HE2072 COURSE NAME : CAREER GUIDANCE LEVEL II	
CO1	Students will analyze and critique logical reasoning, including situations for which the student will recognize underlying assumptions and make reasonable assumptions.
CO2	Students will be able to make decisions with mathematical, statistical, and quantitative information.
CO3	Students would have obtained a multitude of opportunities resulting in the refinement of his/her language skills and the ability to use the skills for effective communication.

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Upon the successful completion of the course, the students will be able to

SEMESTER III

COURSE CODE: 19AI3201 COURSE NAME: DATA STRUCTURES AND ALGORITHMS	
CO1	Understand the concept of data structures and recursive algorithms
CO2	Able to perform various operations on linked lists
CO3	Able to perform various operations on trees and graphs
CO4	Able to perform traversal operations of trees and graphs
CO5	Understand and implement the various algorithm design techniques, searching and sorting techniques.

COURSE CODE: 19AI3202 COURSE NAME: FOUNDATIONS OF ARTIFICIAL INTELLIGENCE	
CO1	Understand the characteristics of intelligent agents
CO2	Understand and implement the Informed search strategies
CO3	Able to Represent a problem using first order logic.
CO4	Apply the Baye's rule to solve the problem
CO5	Analyze the different learning systems to solve a given problem.

COURSE CODE: 19MA3152 COURSE NAME: PROBABILITY AND APPLIED STATISTICS	
CO1	Understand the axiomatic formulation of Probability Theory and think of random variables as an intrinsic need for the analysis of random phenomena
CO2	Express the phenomenon of two dimensional random variables
CO3	Compute and interpret the descriptive statistics, correlation coefficient and rank correlation coefficient, use simple linear regression model to engineering data.
CO4	Understand the concepts of statistical methods for testing of hypothesis with R studio.
CO5	Apply design of experiment techniques to solve various engineering problems

COURSE CODE: 19AI3251 COURSE NAME: DIGITAL PRINCIPLES AND SYSTEM DESIGN	
CO1	Simplify Boolean functions using different methods.
CO2	Analyse, design and implement combinational logic circuits.
CO3	Analyse, design and implement Synchronous sequential logic circuits.
CO4	Analyse, design and implement Asynchronous sequential logic circuits
CO5	Simulate and implement combinational and sequential circuits using HDL.

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COURSE CODE: 19AI3252 COURSE NAME: CLEAN CODING AND DEVOPS	
CO1	Understand the importance of comments in the applications
CO2	Understand the data and object antisymmetric
CO3	Understand Cloud computing concepts
CO4	Explain why DevOps on cloud and various DevOps services available on IBM Cloud

COURSE CODE: 19AI3001R COURSE NAME: DATA STRUCTURES AND ALGORITHMS LABORATORY	
CO1	Apply good programming design methods for program development.
CO2	Apply the different data structures for implementing solutions to practical problems.
CO3	Develop recursive programs using trees and graphs

COURSE CODE: 19AI3002 COURSE NAME: ARTIFICIAL INTELLIGENCE LABORATORY	
CO1	Able to implement facts and rules in Prolog
CO2	Able to solve problems using LISP
CO3	Apply good programming design methods for program development

COURSE CODE: 19MC3191 COURSE NAME: INDIAN CONSTITUTION	
CO1	Understand the functions of the Indian government.
CO2	Understand and abide the rules of the Indian constitution.

PROGRAM NAME – B.Tech AI & ML

Upon the successful completion of the course, the students will be able to

SEMESTER IV

COURSE CODE:19MA4105 COURSE NAME: DISCRETE MATHEMATICAL STRUCTURES	
CO1	Explain and apply basic notions of symbolic logic

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CO2	Identify the differences between a relation and a function
CO3	Solve problems using counting techniques and recurrence relations
CO4	Understand the knowledge about Lattices and Boolean Algebra
CO5	Apply the properties of graphs and trees in computer networks..

COURSE CODE: 19AI4201 COURSE NAME: DATABASE MANAGEMENT SYSTEMS	
CO1	Understand the functional components of DBMS and data models
CO2	Able to write SQL queries
CO3	Analyze a system and design ER diagram and Relational Schema
CO4	Able to perform normalization and write queries using normalization criteria
CO5	Illustrate the concepts for transaction processing, concurrency control and recovery procedures for RDBMS.

COURSE CODE: 19AI4202 COURSE NAME: DATA VISUALIZATION	
CO1	Know the history of data visualization and its connection with computer graphics
CO2	Students understand the foundations and characteristics of data, which forms the beginning of the visualization pipeline.
CO3	Understand the role of user interaction within visualizations, understand the visualization design process.
CO4	Students know some commercial data visualization packages with functionality.

COURSE CODE: 19AI4251 COURSE NAME: OPERATING SYSTEMS	
CO1	Understand the fundamental components of a computer operating system and how computing resources are managed by the operating system
CO2	Apply the concepts of various CPU scheduling algorithms
CO3	Describe and solve Synchronization, Deadlock Problem
CO4	Demonstrate the different memory management techniques used in Operating Systems.
CO5	Implement the basic services and functionalities of the operating system using System Calls in Linux.

COURSE CODE: 19AI4252 COURSE NAME: INTRODUCTION TO MACHINE LEARNING	
CO1	Understand Data Mining & Warehousing concepts
CO2	Unde Understand and distinguish between types of learning

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CO3	Build neural networks using algorithms
CO4	Implement applications with clustering and classification techniques
CO5	Understand evolutionary models

COURSE CODE: 19AI4001R COURSE NAME: DATABASE MANAGEMENT SYSTEMS LABORATORY	
CO1	Use typical data definitions and manipulation commands
CO2	Design applications to test Nested and Join Queries
CO3	Implement simple applications that use Views
CO4	Critically analyze the use of Tables, Views, Functions and Procedures.
CO5	Implement applications that require a Front-end Tool

COURSE CODE: 19AI4002 COURSE NAME: DATA VISUALIZATION LABORATORY	
CO1	Know the history of data visualization and its connection with computer graphics
CO2	Students understand the foundations and characteristics of data, which forms the beginning of the visualization pipeline
CO3	Understand the role of user interaction within visualizations, understand the visualization design process
CO4	Students know some commercial data visualization packages with functionality

COURSE CODE: 19AC4191 COURSE NAME: VALUE EDUCATION ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	
CO1	Ability to understand the structure of Indian system of life
CO2	Connect up and explain basics of Indian Traditional knowledge in modern scientific perspective.

COURSE CODE: 19HE3073 COURSE NAME: IDEATION SKILLS	
CO1	Develop a strong understanding and importance of ideation.
CO2	Learn about the different kinds of tools for Ideation.
CO3	Learn the need and significance of prototyping and its significance.



HICET

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	ELECTRICAL AND ELECTRONICS ENGINEERING
PROGRAMME NAME	ME APPLIED ELECTRONICS
REGULATIONS	R 2020

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO 1	Graduate will be able to execute the principles of basic science, mathematics and engineering fundamentals necessary to formulate, solve and analyze engineering problems.
PEO 2	Graduate will be able to accrete the knowledge for pursuing advanced degrees in Engineering, Science, Management, Research and Development.
PEO 3	Graduate will be able to effectuate professionalism, leadership qualities, self and continuous learning and concern for environment to meet the societal needs.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

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 considerations for the public health and safety, and the cultural, societal and environmental consideration.
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.

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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.
PO 9	**INDIVIDUAL AND TEAM WORK**: Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
PO 10	**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
PO 11	**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 environment.
PO 12	**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.

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COURSE OUTCOMES (COs)

PROGRAM NAME – ME-APPLIED ELECTRONICS

Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSE CODE : 20MA1102 COURSE NAME: ADVANCED MATHEMATICS FOR ELECTRICAL AND ELECTRONICS ENGINEERING	
CO1	Acquire the basic concepts of Probability and Statistical techniques for solving mathematical problem which will be useful in solving engineering problems.
CO2	Apply transportation and assignment models to find optimal solution in warehousing and travelling.
CO3	Prepare project scheduling using PERT and CPM.
CO4	Achieve an understanding of the basic concepts of algebraic equations and method of solving
CO5	Apply the Fuzzy logic in power system problems

COURSE CODE : 20AE1201 COURSE NAME: ADVANCED DIGITAL SYSTEM DESIGN	
CO1	Design and analysis of sequential circuit.
CO2	Design and analysis of asynchronous sequential circuit.
CO3	Explore fault diagnosis and testability algorithm
CO4	Learn of programmable logic devices.
CO5	Design and analysis of hardware description languages.

COURSE CODE : 20AE1202 COURSE NAME: EMBEDDED SYSTEM DESIGN	
CO1	Identify the various embedded system design
CO2	Evaluate the general and single purpose processors
CO3	Compare various bus structures
CO4	Recognize the process models
CO5	Apply the embedded software development tools

COURSE CODE : 20AE1203 COURSE NAME: DIGITAL IMAGE PROCESSING	
CO1	Identify various arithmetic and geometrical operations of image fundamental.
CO2	Analyze the operation Image transforms and Enhancement.

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CO3	Design Image compression and restoration techniques.
CO4	Design the Image compression and Segmentation.
CO5	Create models for color and multispectral image processing

COURSE CODE : 20AE1204 COURSE NAME: RESEARCH METHODOLOGY	
CO1	Observe the various approaches to do research.
CO2	Carryout the research design.
CO3	Evaluate the data collection for research activities.
CO4	Acknowledge the function of Multivariate Analysis Techniques
CO5	Organize the research activity systematically and prepare research report effectively

COURSE CODE : 20AE1001 COURSE NAME: ELECTRONIC SYSTEM DESIG LABORATORY	
CO1	Design various analog / digital transceiver systems and control different process.
CO2	Analyze flash controller programming and wireless data modem.
CO3	Analyze PCB designing for various circuits.
CO4	Propose interfaces using modulator and demodulator.
CO5	Design and analysis of operational and instrumentation amplifiers.

COURSE CODE : 20AE1002 COURSE NAME: EMBEDDED SYSTEMS LABORATORY	
CO1	Design various analog / digital transceiver systems and control different process.
CO2	Propose interfaces using embedded Microcontroller.
CO3	Experiment Wireless Network Using Embedded Systems.
CO4	Analyze the system using 8086 and 8051 Microcontroller.
CO5	Design and Analysis of Real Time Operating System

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COURSE OUTCOMES (COs)

SEMESTER II

COURSE CODE : 20AE2201 COURSE NAME: ANALOG INTEGRATED CIRCUIT DESIGN	
CO1	Design and analysis of amplifiers.
CO2	Aquire of frequency response and noise analysis.
CO3	Familiarize the Operational Amplifiers.
CO4	Compose different types of Biasing Circuits.

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CO5	Gain knowledge about the engineering applications of Analog Integrated Circuits

COURSE CODE : 20AE2202 **COURSE NAME: VLSI DESIGN TECHNIQUES**	
CO1	Identify various MOS transistor theory
CO2	Analyze the CMOS technology and to design.
CO3	Design and analyze circuit characteristics and Performance.
CO4	Design the VLSI system components and circuits.
CO5	Create models using Verilog programming

COURSE CODE : 20AE2001 **COURSE NAME: VLSI DESIGN LABORATORY**	
CO1	Use the software tools for designing and simulation.
CO2	Design the various VLSI circuits using VHDL programming.
CO3	Familiarize the applications of VLSI circuits.
CO4	Analysis the MAC unit using verilog.
CO5	Design the VLSI circuits using Xillinx ISE tool.

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COURSE OUTCOMES (COs)

PROFESSIONAL ELECTIVE-I

COURSE CODE : 20AE2301 **COURSE NAME: ADVANCED DIGITAL SIGNAL PROCESSING**	
CO1	Identify various arithmetic and geometrical operations for random signals.
CO2	Analyze the spectrum estimation.
CO3	Analyze linear estimation and Prediction.
CO4	Design the adaptive Filters.
CO5	Analyze the multirate digital signal processing.

COURSE CODE : 20AE2302 **COURSE NAME: ADVANCED MICROPROCESSORS & MICROCONTROLLERS**	
CO1	To understand the fundamentals of microprocessor architecture.
CO2	To know and appreciate the high performance features in CISC architecture.

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CO3	To know and appreciate the high performance features in RISC architecture.
CO4	To perceive the basic features in Motorola microcontrollers.
CO5	To interpret and understand PIC Microcontroller.

COURSE CODE : 19AE2303 COURSE NAME: ASIC AND FPGA DESIGN	
CO1	Summarize the concepts of ASIC and PLD
CO2	Apply the different high performance algorithms in ASICs
CO3	Demonstrate the synthesis, simulation and testing of digital systems
CO4	Outline the different architectures of FPGA
CO5	Discuss the design issues of SOC

PROFESSIONAL ELECTIVE-II

COURSE CODE : 20AE2304 COURSE NAME: COMPUTER ARCHITECTURE AND PARALLEL PROCESSING	
CO1	Design and analysis of computer architecture and performance.
CO2	Learn the difference between pipeline and parallel processing concepts.
CO3	Analysis of Memory Technology and Optimization
CO4	Learn the distribution of shared memory architectures.
CO5	Design and analysis of multi core architecture

COURSE CODE : 20AE2305 COURSE NAME: CAD FOR VLSI DESIGN	
CO1	Summarize the various physical design methods in VLSI
CO2	Apply the various VLSI design rules.
CO3	Outline the concept of floor planning and routing
CO4	Demonstrate the concept of Simulation and Logic Synthesis
CO5	Discuss the hardware models for high level synthesis

PROFESSIONAL ELECTIVE-III

COURSE CODE : 20AE2307 COURSE NAME: ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY	
CO1	Real world EMC deigns constraints and to achieve the most cost effective design that meets all requirements.
CO2	Diagnose and solve the basic electromagnetic compatibility problems.
CO3	Designing the electronic system that function without errors or problems that are related to electromagnetic compatibility.
CO4	Measuring the EMI with various methods and comparing it with standards.

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CO5	Controlling techniques for EMI and EMC

COURSE CODE : 20AE2308 **COURSE NAME: WIRELESS ADHOC AND SENSOR NETWORKS**	
CO1	Identify different issues in wireless ad hoc and sensor networks.
CO2	Analyze protocols developed for ad hoc and sensor networks.
CO3	Identify and address the security threats in ad hoc and sensor
CO4	Establish a Sensor network environment for different type of applications.
CO5	Understand the security in Ad hoc and Sensor networks

COURSE CODE -20AE2309 **COURSE NAME :ROBOTICS AND INTELLIGENT SYSTEMS**	
CO1	Ability to implement simple concepts associated with Robotics and Automation
CO2	Ability to use various Robotic sub-systems
CO3	Ability to use kinematics and dynamics to design exact working pattern of robots
CO4	Ability to implement computer vison algorithms for robots
CO5	Be aware of the associated recent updates in Robotics

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	**COURSE OUTCOMES (COs)**

SEMESTER III

COURSE CODE -20AE3901 **COURSE NAME : DISSERTATION - I**	
CO1	Realize the skills acquired in the previous semesters to solve complex engineering problems.
CO2	Build up an innovative model / prototype of an idea related to the field of specialization.
CO3	Create the work individually to identify, troubleshoot and build products for environmental and societal issues.
CO4	Effective presentation of ideas with clarity.
CO5	Evaluate surveys towards developing a product which helps in life time learning

SEMESTER IV

COURSE CODE -20AE4901

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COURSE NAME : DISSERTATION - II	
CO1	Realize the skills acquired in the previous semesters to solve complex engineering problems.
CO2	Build up an innovative model / prototype of an idea related to the field of specialization.
CO3	Create the work individually to identify, troubleshoot and build products for environmental and societal issues.
CO4	Effective presentation of ideas with clarity.
CO5	Evaluate surveys towards developing a product which helps in life time learning

PROFESSIONAL ELECTIVE-IV

COURSE CODE : 20AE3301 COURSE NAME: INTELLIGENT SYSTEMS AND CONTROL	
CO1	Infer the concepts of Neural Networks.
CO2	Summarize the various neural networks architectures and its training algorithms
CO3	Design the neural network/fuzzy logic control for real time applications.
CO4	Discover the concept of fuzzy logic set theory.
CO5	Implement the fuzzy mechanism for suitable control problems.

COURSE CODE : 20AE3302 COURSE NAME: AN INTRODUCTION TO ELECTRONICS SYSTEMS PACKAGING	
CO1	Give a comprehensive introduction to the various packaging types used along with the associated thermal, speed, signal and integrity power issues.
CO2	Enable design of packages which can withstand higher temperature, vibrations and shock
CO3	Design of PCBs which minimize the EMI and operate at higher frequency
CO4	Analyze the concepts of printed wiring board Technologies and Surface Mount Technology.
CO5	Design of Embedded Passives Technology

COURSE CODE : 20AE3303 COURSE NAME: IOT SYSTEM DESIGN AND SECURITY	
CO1	Articulate the main concepts, key technologies, strength and limitations of IoT. CO2:
CO2	Identify the architecture, infrastructure models of IoT.
CO3	Analyze the core issues of IoT such as security, privacy and interoperability.
CO4	Analyze and design different models for network dynamics.
CO5	Identify and design the new models for market strategic interaction.

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PROFESSIONAL ELECTIVE-V

COURSE CODE : 20AE3304 COURSE NAME: HARDWARE - SOFTWARE CO-DESIGN	
CO1	To outline and apply design methodologies
CO2	To appreciate the fundamental building blocks of the using hardware and software co-design
CO3	To implementation and testing environments and techniques and their inter-relationships
CO4	To modern hardware/software tools for building prototypes
CO5	To demonstrate practical competence in these areas.

COURSE CODE : 20AE3305 COURSE NAME: ELECTRONICS FOR SOLAR POWER	
CO1	Ability to collect solar power characteristics at a given location
CO2	Ability to design and realize dc-dc converters for solar power utilization
CO3	Ability to design algorithms for improving solar power utilization
CO4	Ability to deal with battery issues and selection
CO5	Ability to design and simulate PV systems to validate its performance.

COURSE CODE : 20AE3306 COURSE NAME: PCB DESIGN AND FABRICATION	
CO1	To understand the basics, industry standards organizations related to the design and fabrication of PCBs.
CO2	Leads new users of the software through a very simple design
CO3	To know and guide in designing plated through-holes, surface-mount lands, and Layout footprints in general.
CO4	To know to construct Capture parts using the Capture Library Manager and Part Editor and the PSpice Model Editor.
CO5	To understand and to fabricate PCBs

OPEN ELECTIVE

COURSE CODE : 20AE3401 COURSE NAME: ROBOTICS	
CO1	Understand robot locomotion and mobile robot kinematics.
CO2	Understand perception in robotics.
CO3	Apply robot localization techniques.
CO4	Apply robot mapping techniques.
CO5	Explain planning and navigation in robotics.

COURSE CODE : 20AE3402 COURSE NAME: ARTIFICIAL INTELLIGENCE AND OPTIMIZATION TECHNIQUES	
CO1	Ability to design and train neural networks with different rules
CO2	Ability to devise fuzzy logic rules

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CO3	Ability to implement genetic algorithms
CO4	Ability to implement ANT colony optimization technique for various problems
CO5	Ability to use PSO technique

COURSE CODE : 20AC1091 COURSE NAME: ENGLISH FOR RESEARCH PAPER WRITING	
CO1	Understand that how to improve your writing skills and level of readability
CO2	Learn about what to write in each section
CO3	Understand the skills needed when writing a Title
CO4	Understand the skills needed when writing the Conclusion
CO5	Ensure the good quality of paper at very first-time submission

COURSE CODE : 20AC1092 COURSE NAME: DISASTER MANAGEMENT	
CO1	Ability to summarize basics of disaster
CO2	Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response
CO3	Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO4	Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations
CO5	Ability to develop the strengths and weaknesses of disaster management approaches

COURSE CODE : 20AC1093 COURSE NAME: SANSKRIT FOR TECHNICAL KNOWLEDGE	
CO1	Understanding basic Sanskrit language
CO2	Write sentences.
CO3	Know the order and roots of Sanskrit.
CO4	Know about technical information about Sanskrit literature.
CO5	Understand the technical concepts of Engineering.

COURSE CODE : 20AC1094 COURSE NAME: VALUE EDUCATION	
CO1	Students will understand the importance of value based living.
CO2	Students will gain deeper understanding about the purpose of their life.
CO3	Students will understand and start applying the essential steps to become good leaders.
CO4	Students will emerge as responsible citizens with clear conviction to practice values and ethics in life.
CO5	Students will become value based professionals and building a healthy nation.

COURSE CODE : 20AC1095

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COURSE NAME: CONSTITUTION OF INDIA	
CO1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
CO3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leadership of Jawaharlal Nehru
CO4	The eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
CO5	Discuss the passage of the Hindu Code Bill of 1956.

COURSE CODE : 20AC2091 COURSE NAME: PEDAGOGY STUDIES	
CO1	What pedagogical practices are being used by teachers informal and informal classrooms in developing countries?
CO2	What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
CO3	How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
CO4	How can teacher to develop their Professional development support effective pedagogy?
CO5	How can improve the Research and Future Direction using effective pedagogy.

COURSE CODE : 20AC2092 COURSE NAME: STRESS MANAGEMENT BY YOGA	
CO1	Develop healthy mind in a healthy body thus improving social health also
CO2	Improve efficiency
CO3	The student will apply forces and exert themselves using rarely used muscle groups

COURSE CODE : 20AC2093 COURSE NAME: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	
CO1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
CO2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity
CO3	Study of Neet is hatakam will help in developing versatile personality of students.

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	ELECTRONICS AND COMMUNICATION ENGINEERING
PROGRAMME NAME	ME COMMUNICATION SYSTEMS
REGULATIONS	R 2020

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO 1	To prepare the graduates to solve, analyze and develop real time engineering products by providing strong foundation in the fundamentals of Electronics and Communication Engineering
PEO 2	To prepare the graduates to succeed in multidisciplinary dimensions by providing adequate trainings and exposure to emerging technologies
PEO 3	To prepare the graduates to become a successful leader and innovator following ethics with the sense of social responsibility for providing engineering solutions

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

PO 1	**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 considerations for the public health and safety, and the cultural, societal and environmental consideration.
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

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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.
PO 9	**INDIVIDUAL AND TEAM WORK**: Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
PO 10	**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
PO 11	**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 environment.
PO 12	**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.

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COURSE OUTCOMES (COs)

PROGRAM NAME – ME COMMUNICATION SYSTEMS

Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSE CODE : 20MA1102 **COURSE NAME: ADVANCED MATHEMATICS FOR ELECTRICAL AND ELECTRONICS ENGINEERING**	
CO1	Acquire the basic concepts of Probability and Statistical techniques for solving mathematical problem which will be useful in solving engineering problems.
CO2	Apply transportation and assignment models to find optimal solution in warehousing and travelling..
CO3	Prepare project scheduling using PERT and CPM.
CO4	Achieve an understanding of the basic concepts of algebraic equations and method of solving
CO5	Apply the Fuzzy logic in power system problems

COURSE CODE : 20CM1201 **COURSE NAME: DIGITAL MODULATION AND CODING TECHNIQUES**	
CO1	Formulate a mathematical model for digital modulation schemes.
CO2	Design optimum coherent and non coherent receiver for digital modulation schemes
CO3	Apply mathematical modeling for BER analysis and Band width calculation of digital modulation schemes
CO4	Compare the performance of linear block codes
CO5	Design channel encoder and decoder based on the given specification using the channel coding algorithms.

COURSE CODE : 20CM1202 **COURSE NAME: ADVANCED DIGITAL SIGNAL PROCESSING**	
CO1	Interpret functions of various systems and signals.
CO2	Analyze working and operation of different filter
CO3	Understand the concept of various signal processing.
CO4	:Analyze and understand the power spectrum of different filters
CO5	Analysze and understand the concepts of adaptive filter

COURSE CODE : 20CM1203 **COURSE NAME: OPTICAL COMMUNICATION NETWORKS**	
CO1	Interpret functions of various optical network components.
CO2	Analyze broadcast-and-select and wavelength routing networks
CO3	Understand the working of various power devices and display devices.

CO4	Explain photonic packet switching concepts and access networks
CO5	Analysze different network management functions

COURSE CODE : 20CM1204 COURSE NAME: RF SYSTEM DESIGN	
CO1	Describe the various active and passive components of RF circuits
CO2	Analyze the microstrip line filters
CO3	Analyze the biasing methods for RF amplifiers
CO4	Design matching networks using smith chart.
CO5	Compare various Oscillators for their performance.

COURSE CODE : 20CM1205 COURSE NAME: RESEARCH METHODOLOGY AND IPR	
CO1	Ability to formulate research problem
CO2	Ability to carry out research analysis
CO3	Ability to follow research ethics
CO4	Ability to understand that today's world is controlled by Computer, Information Technology, but
CO5	:tomorrow world will be ruled by ideas, concept, and creativity
CO6	Ability to understand about IPR and filing patents in R & D.

COURSE CODE : 20CM1001 COURSE NAME: SIGNAL PROCESSING AND COMMUNICATION LABORATORY	
CO1	Design filter for processing specific frequency bands
CO2	Implement the adaptive filtering algorithms
CO3	Estimate and predict the noise for effective communication
CO4	generate and detect digital communication signals of various modulation techniques
CO5	Evaluate cellular mobile communication technology and propagation model

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SEMESTER II

COURSE CODE : 20CM2201

COURSE NAME: ADVANCED WIRELESS COMMUNICATION AND NETWORKS	
CO1	Analyze the basics of multipath propagation and its characteristics
CO2	Compare and contrast the performance of OFDM and OFDMA systems
CO3	Describe the operation of transmitter and receiver of MC-CDMA, MIMO and LTE systems
CO4	Demonstrate the impact of cognitive radio and its applications
CO5	Analyze the various wireless networks and its characteristics

COURSE CODE : 20CM2202 COURSE NAME: MICROWAVE INTEGRATED CIRCUITS	
CO1	Understand the theory of transmission lines used at microwave frequencies
CO2	Design and analyze various impedance matching networks using microwave components.
CO3	Perform stability analysis and be able to design amplifiers and oscillators at microwave frequencies
CO4	Understand and analyze various the mixer and control circuits used at microwave frequencies
CO5	Perform stability analysis in the design of microwave amplifiers and oscillators

COURSE CODE : 20CM2001 COURSE NAME: COMMUNICATION NETWORKS LABORATORY	
CO1	Design and analyse the multipath fading channels and diversity.
CO2	Design and implement BER performance of OFDM scheme
CO3	Analyse the performance of MIMO for multi carrier system.
CO4	Analyze the performance of MC-CDMA system.
CO5	Design and implement communication protocol for different functionalities

COURSE CODE : 20AC1091 COURSE NAME: ENGLISH FOR RESEARCH PAPER WRITING	
CO1	Understand that how to improve your writing skills and level of readability
CO2	Learn about what to write in each section
CO3	Understand the skills needed when writing a Title
CO4	Understand the skills needed when writing the Conclusion
CO5	Ensure the good quality of paper at very first-time submission

COURSE CODE : 20AC1092 COURSE NAME: DISASTER MANAGEMENT	
CO1	Ability to summarize basics of disaster
CO2	Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response

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CO3	Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO4	Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations
CO5	Ability to develop the strengths and weaknesses of disaster management approaches

COURSE CODE : 20AC1093 COURSE NAME: SANSKRIT FOR TECHNICAL KNOWLEDGE	
CO1	Understanding basic Sanskrit language
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CO4	Know about technical information about Sanskrit literature.
CO5	Understand the technical concepts of Engineering.

COURSE CODE : 20AC1094 COURSE NAME: VALUE EDUCATION	
CO1	Students will understand the importance of value based living.
CO2	Students will gain deeper understanding about the purpose of their life.
CO3	Students will understand and start applying the essential steps to become good leaders.
CO4	Students will emerge as responsible citizens with clear conviction to practice values and ethics in life.
CO5	Students will become value based professionals and building a healthy nation.

COURSE CODE : 20AC1095 COURSE NAME: CONSTITUTION OF INDIA	
CO1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
CO3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leadership of Jawaharlal Nehru
CO4	The eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
CO5	Discuss the passage of the Hindu Code Bill of 1956.

COURSE CODE : 20AC2091 COURSE NAME: PEDAGOGY STUDIES	
CO1	What pedagogical practices are being used by teachers informal and informal classrooms in developing countries?
CO2	What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
CO3	How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

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CO4	How can teacher to develop their Professional development support effective pedagogy?
CO5	How can improve the Research and Future Direction using effective pedagogy.

COURSE CODE : 20AC2092 **COURSE NAME: STRESS MANAGEMENT BY YOGA**	
CO1	Develop healthy mind in a healthy body thus improving social health also
CO2	Improve efficiency
CO3	The student will apply forces and exert themselves using rarely used muscle groups

COURSE CODE : 20AC2093 **COURSE NAME: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS**	
CO1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
CO2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity
CO3	Study of Neet is hatakam will help in developing versatile personality of students.

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PROFESSIONAL ELECTIVES

COURSE CODE : 20CMX301 **COURSE NAME: INFORMATION THEORY AND CODING TECHNIQUES**	
CO1	Analyze various source coding and decoding techniques
CO2	Analyze various iteratively decoded codes and their techniques
CO3	Understand and analyze various low density parity check codes.
CO4	Understand the design of LDPC decoders.
CO5	Understand the design principles and solve problems using space-time coding techniques

COURSE CODE : 20CMX303 **COURSE NAME: VEHICULAR SYSTEMS AND NETWORK**	
CO1	Understand the basic concepts of vehicular networks and the applications.

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CO2	Understand MAC protocols and heterogeneous wireless communication used in vehicular networks.
CO3	Evaluate the routing protocols and IP address configuration.
CO4	Analyze message scheduling and network mobility problem in vehicular networks

COURSE CODE : 20CMX304 COURSE NAME: ADVANCED RADIATION SYSTEMS	
CO1	Understand the fundamentals behind the recent techniques in antenna technology
CO2	Design and assess the performance of various Aperture and Reflector antennas
CO3	Analyze various broadband antennas and design techniques
CO4	Design a Micro strip antenna
CO5	Identify the antennas specific to the applications

COURSE CODE : 20CMX305 COURSE NAME: EMBEDDED AND INTERNET OF THINGS	
CO1	Describe the architecture of embedded system and compare various embedded processors.
CO2	Understand and compare various communication protocols.
CO3	Describe the concepts of IoT.
CO4	Describe cloud servers and APP development.
CO5	Analyze applications of IoT in real time scenario

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COURSE OUTCOMES (COs)

COURSE CODE : 20CMX306 COURSE NAME: WIRELESS SENSOR NETWORKS	
CO1	Able to define wireless sensor networks for various applications
CO2	CO2: To design multiple architectures to build wireless sensor networks.
CO3	CO3: To Estimate the protocols to ensure proper message transfer between node
CO4	To Construct wireless sensor networks in exact positions with proper control over it
CO5	To Choose a proper hardware with software to build sensor network with multiple tools

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COURSE CODE : 20CMX307 COURSE NAME: COGNITIVE RADIO NETWORK	
CO1	Appreciate the motivation and the necessity for cognitive radio communication strategies.
CO2	Demonstrate understanding of the enabling technologies for its implementation
CO3	Demonstrate understanding of the essential functionalities and requirements in designing software defined radios and their usage for cognitive communication.
CO4	Evolve new techniques and demonstrate their feasibility using mathematical validations and simulation tools.
CO5	Interpret the impact of the evolved solutions in future wireless network design.

COURSE CODE : 20CMX308 COURSE NAME: MICRO-ELECTRO MECHANICAL SYSTEMS	
CO1	Able to demonstrate an understanding of the different aspects of micro-system design. .
CO2	Familiar with Mechanical and the Electrostatic design aspects
CO3	Familiar with the different applications and their design basics
CO4	In a position to identify a suitable MEMS structure, material and fabrication procedure based on the application and functionality.
CO5	Capable of applying his knowledge and design tools and will be well practiced in design skills

COURSE CODE : 20CMX309 COURSE NAME: HIGH SPEED SWITCHING AND NETWORK	
CO1	Familiar with the basics of switching technologies and their implementation in LANs, ATM , IP and Optical networks.
CO2	Familiar with the different switching architectures and queuing strategies
CO3	Able to analyze switching networks based on their blocking performances and implementation complexities.
CO4	Able to identify suitable switch architectures for a specified networking scenario
CO5	To apply switching technologies, architectures and buffering strategies for designing high speed communication networks and analyse their performance

COURSE CODE : 20CMX310 COURSE NAME: SATELLITE COMMUNICATIONS AND NAVIGATION SYSTEMS	
CO1	Demonstrate an understanding of the basic principles of satellite based communication the essential elements involved and the transmission methodologies.

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CO2	Familiarize with satellite orbits, placement and control, satellite link design and the communication system components.
CO3	Demonstrate an understanding of the different interferences and attenuation mechanisms affecting the satellite link design.
CO4	Demonstrate an understanding of the different communication, sensing and navigational applications of satellite.
CO5	Familiarize with the implementation aspects of existing satellite based systems

COURSE CODE :20CMX311 COURSE NAME: MASSIVE MIMO AND mmWAVE SYSTEMS	
CO1	Ability to appreciate Massive MIMO: characteristics and implementation challenges.
CO2	Understand the need and impact of different precoding approaches.
CO3	Ability to characterize propagation issues at Millimeter wave frequencies
CO4	Ability to estimate link budget and identity Millimeter wave devices and circuits specifications
CO5	Understand and appreciate the various implementation aspects of mmWave MIMO systems.

COURSE CODE : 20CMX312 COURSE NAME: MACHINE LEARNING	
CO1	Demonstrate understanding of the mathematical principles underlying machine learning. .
CO2	Familiar with the different machine learning techniques and their use cases.
CO3	In a position to formulate machine learning problems corresponding to different applications.
CO4	Able to recognize the characteristics of machine learning techniques that are useful to solve real-world problems.
CO5	In a position to read current research papers, understand the issues and the machine learning based solution approaches

COURSE CODE : 20CMX313 COURSE NAME: COMMUNICATION PROTOCOL FOR IOT	
CO1	Study the introduction of IoT.
CO2	Ability to understand the concepts of 6LOWPAN and RPL
CO3	Understand the working of various Zigbee function and security.
CO4	Explain different architecture of M2M
CO5	Analysze different output devices



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COURSE OUTCOMES (COs)

COURSE CODE : 20CMX314 COURSE NAME: SPEECH SIGNAL PROCESSING	
CO1	Describe the fundamentals of speech and Model speech production.
CO2	Estimate the different parameters and analysis in speech signal.
CO3	Implement linear predictive analysis and extract features of speech signal.
CO4	Build speech synthesis systems.
CO5	Choose an appropriate algorithm in speech model for a given application

COURSE CODE : 20CMX315 COURSE NAME: MULTIMEDIA COMPRESSION	
CO1	Able to differentiate different coding techniques.
CO2	Able to understand different arithmetic coding techniques.
CO3	Able to illustrate different audio compression standards
CO4	Able to illustrate different Image compression standards
CO5	Able to differentiate different video compression standards

COURSE CODE : 20CMX316 COURSE NAME: WAVELETS AND SUBBAND CODING	
CO1	Interpret analysis on various transform.
CO2	Understand fundamentals of Continuous Wavelet Transforms
CO3	Understand the fundamentals of Discrete Wavelet Transforms
CO4	Explain concepts of various advanced wavelet techniques
CO5	design applications based on wavelets

COURSE CODE : 20CMX317 COURSE NAME: DEEP LEARNING	
CO1	Analyze and apply the basic the concepts of neural networks
CO2	Analyze various types of neural networks and use various activation functions to solve complex problems.
CO3	Relate the concept of deep learning and its architecture. .
CO4	Design and carry out empirical analysis for various types of applications of deep learning systems

COURSE CODE : 20CMX318 COURSE NAME: SPREAD SPECTRUM COMMUNICATIONS	
CO1	Ability to understand the concept of Spread Spectrum and study various types of Spread spectrum sequences and their generation.

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CO2	Ability to understand the principles of Code Division Multiple Access (CDMA) and use of Spread spectrum concept in CDMA
CO3	Ability to understand various Code tracing loops for optimum tracking of wideband signals viz spread spectrum signals
CO4	Ability to understand the procedure for synchronization of receiver for receiving the Spread spectrum signal.
CO5	Study the performance of spread spectrum systems in Jamming environment, systems with Forward Error Correction and Multiuser detection in CDMA cellular radio

COURSE CODE : 20CMX319 COURSE NAME: BLOCK CHAIN AND ITS APPLICATIONS	
CO1	Ability to understand the need for Blockchain
CO2	Ability to explore the major components of Blockchain
CO3	Ability to learn about Hyperledger Fabric model and its Architecture
CO4	Ability to identify the use cases for a Blockchain application

COURSE CODE : 20CMX320 COURSE NAME: 5G TECHNOLOGY	
CO1	Able to analyze the performance of different channel models adopted in 5G wireless systems.
CO2	Able to design a transceiver for Multicarrier waveforms.
CO3	Able to analyze multiple access techniques in 5G networks
CO4	Able to design a pilot, estimate channels and analyze capacity for single cell and multicell Massive MIMO
	Able to analyze different types of cooperative communications

COURSE CODE : 20CM34XX COURSE NAME: GREEN COMMUNICATION	
CO1	To gain the knowledge about green radio networks
CO2	To work with green modulation and coding technique.
CO3	To apply the energy efficiency technique with wireless networks
CO4	To analyze the radio techniques to reduce the overall energy consumption.
CO5	To design new green radio architectures

HICET

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	COMPUTER SCIENCE &ENGINEERING
PROGRAMME NAME	M.E COMPUTER SCIENCE &ENGINEERING
REGULATION	R2020

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO 1	To acquire knowledge in the latest technologies and innovations and an ability to identify, analyze and solve problems in computer engineering.
PEO 2	To be capable of modeling, designing, implementing and verifying a computing system to meet specified requirements for the benefit of society.
PEO 3	To possess critical thinking, communication skills, teamwork, leadership skills and ethical behavior necessary to function productively and professionally

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

PO 1	**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.

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PO5	**MODERN TOOL USAGE**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling 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.
PO 9	**INDIVIDUAL AND TEAM WORK**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**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.
PO 11	**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.
PO 12	**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.



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COURSE OUTCOMES (COs)

PROGRAM NAME – ME CSE

Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSE CODE : 20MA1103 COURSE NAME: MATHEMATICAL FOUNDATION OF CSE	
CO1	Formulate and find optimal solution in the real life optimizing /allocation/assignment problems involving conditions and resource constraints
CO2	Simulate appropriate application/distribution problems
CO3	Obtain the value of the point estimators using the method of moments and method of maximum likelihood.
CO4	Apply the concept of various test statistics used in hypothesis testing for mean and variances of large and small samples.
CO5	Get exposure to the principal component analysis of random vectors and matrices.

COURSE CODE : 20CP1201 COURSE NAME: ADVANCE DATA STRUCTURES	
CO1	Analyze algorithms.
CO2	Determine algorithm correctness.
CO3	Choose appropriate data structures for the problems to be solved.
CO4	Design algorithms for problems from different domains.
CO5	Identify various research strategies on algorithmic design

COURSE CODE : 20CP1202 COURSE NAME: ADVANCED DATABASE MANAGEMENT SYSTEM	
CO1	Design and implement relational databases
CO2	Design and implement parallel and distributed databases.
CO3	Design and implement XML databases, Active, Temporal and Deductive databases.
CO4	Implement the concept of database connectivity with the applications.
CO5	Design and implement NoSQL database.

COURSE CODE : 20CP1203 COURSE NAME: SOFTWARE ARCHITECTURE

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CO1	Understand the need of software architecture for sustainable dynamic systems
CO2	Have a sound knowledge on design principles and to apply for large scale systems
CO3	Design architectures for distributed heterogeneous systems
CO4	Have good knowledge on service oriented and model driven architectures and the aspect oriented architecture
CO5	Have a working knowledge to develop appropriate architectures through various case studies.

COURSE CODE : 20RM1161 COURSE NAME: RESEARCH METHODOLOGY AND IPR	
CO1	Ability to formulate research problem.
CO2	Ability to carry out research analysis.
CO3	Ability to follow research ethics.
CO4	Ability to understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
CO5	Ability to understand about IPR and filing patents in R & D.

COURSE CODE : 20CP1001 COURSE NAME: ADVANCED DATA STRUCTURES LABORATORY	
CO1	Achieve programming skill to convert a problem to a programming logic.
CO2	Apply suitable data structure for the problem in hand.
CO3	Implement heap and various tree structures like AVL, Red-black, B-Tree and segment trees.
CO4	Understand the usage of data structures for geometric problems.
CO5	Understand the importance of height balancing in search structures.

COURSE CODE : 20CP1002 COURSE NAME: ADVANCED DATABASE MANAGEMENT SYSTEM LABORATORY	
CO1	Ability to use databases for building web applications
CO2	Gaining knowledge about the internals of a database system

AUDIT COURSE I

COURSE CODE : 20AC1091 COURSE NAME: ENGLISH FOR RESEARCH PAPER WRITING	
CO1	Understand that how to improve your writing skills and level of readability

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CO2	Learn about what to write in each section
CO3	Understand the skills needed when writing a Title
CO4	Understand the skills needed when writing the Conclusion
CO5	Ensure the good quality of paper at very first-time submission

COURSE CODE : 20AC1092 COURSE NAME: DISASTER MANAGEMENT	
CO1	Ability to summarize basics of disaster
CO2	Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response
CO3	Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives
CO4	Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations
CO5	Ability to develop the strengths and weaknesses of disaster management approaches

COURSE CODE : 20AC1093 COURSE NAME: SANSKRIT FOR TECHNICAL KNOWLEDGE	
CO1	Understanding basic Sanskrit language
CO2	Write sentences
CO3	Know the order and roots of Sanskrit.
CO4	Know about technical information about Sanskrit literature.
CO5	Understand the technical concepts of Engineering

COURSE CODE : 20AC1094 COURSE NAME: PEDAGOGY STUDIES	
CO1	What pedagogical practices are being used by teacher's informal and informal classrooms in developing countries?
CO2	What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
CO3	How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
CO4	How can teacher to develop their Professional development support effective pedagogy?
CO5	How can improve the Research and Future Direction using effective pedagogy.

COURSE CODE : 20AC1095 COURSE NAME: CONSTITUTION OF INDIA	
CO1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics

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CO2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India
CO3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leadership of Jawaharlal Nehru
CO4	The eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
CO5	Discuss the passage of the Hindu Code Bill of 1956.

HICET	**COURSE OUTCOMES (COs)**

SEMESTER II

COURSE CODE : 20CP2201 **COURSE NAME: ADVANCED ALGORITHMS**	
CO1	Analyze the algorithm's efficiency of any given problem. (K4)
CO2	Apply different algorithmic design techniques to solve the problem. (S2, K3)
CO3	Use various efficient optimization techniques and parallel algorithms to reduce space complexity. (S5, K2)
CO4	Develop different approximation algorithm for P and NP class Problems. (S3, A2)

COURSE CODE : 20CP2202 **COURSE NAME: CLOUD COMPUTING TECHNOLOGIES**	
CO1	Articulate the main concepts, key technologies, strengths and limitations of cloud computing
CO2	Identify the architecture, infrastructure and delivery models of cloud computing.
CO3	Explain the core issues of cloud computing such as security, privacy and interoperability.
CO4	Choose the appropriate technologies, algorithms and approaches for the related issues.
CO5	Facilitate Service Level Agreements (SLA).

COURSE CODE : 20CP2251

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COURSE NAME: MACHINE LEARNING TECHNIQUES	
CO1	Design a learning model appropriate to the application.
CO2	Design a Neural Network for an application of your choice.
CO3	Implement Probabilistic Discriminative and Generative algorithms for an application of your choice and analyze the results.
CO4	Use a tool to implement typical Clustering algorithms for different types of applications.
CO5	Design and implement an HMM for a Sequence Model type of application.

COURSE CODE : 20CP2001 COURSE NAME: ADVANCED ALGORITHMS LABORATORY	
CO1	Students will be able to choose appropriate advanced data structure for given problem.
CO2	Students will be able to calculate complexity.
CO3	Students will be able to select appropriate design techniques to solve real world problems.
CO4	Students will able to apply the dynamic programming technique to solve the problems.
CO5	Students will be able to select a proper pattern matching algorithm for given problem

PROFESSIONAL ELECTIVE - I

COURSE CODE : 20CP2301 COURSE NAME: AGENT BASED INTELLIGENT SYSTEM	
CO1	Students will gain deep understanding of the basic artificial intelligence techniques.
CO2	Students will apply their knowledge to design solutions to different problems.
CO3	Students will have the ability to design and develop an intelligent system for a selected application.
CO4	An ability to work individually or as a member with responsibility to function on multidisciplinary teams.
CO5	Ability to understand and apply computational platforms and software tools for Information Technology applications

COURSE CODE : 20CP2302 COURSE NAME: MULTICORE ARCHITECTURES	
CO1	Identify the limitations of ILP and the need for multicore architectures.
CO2	Discuss the issues related to multiprocessing and suggest solutions.
CO3	Point out the salient features of different multicore architectures and

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	how they exploit parallelism.
CO4	Point out the various optimizations that can be performed to improve the memory hierarchy design.
CO5	Point out the salient features of vector, GPU and domain specific architectures.

COURSE CODE : 20CP2303 COURSE NAME: SOFTWARE DESIGN PATTERNS	
CO1	Construct a design consisting of a collection of modules.
CO2	Exploit well-known design patterns (such as Iterator, Observer, Factory and Visitor).
CO3	Distinguish between different categories of design patterns.
CO4	Ability to understand and apply common design patterns to incremental/iterative development.
CO5	Ability to identify appropriate patterns for design of given problem.
CO6	Design the software using Pattern Oriented Architectures.

PROFESSIONAL ELECTIVE - II

COURSE CODE : 20CP2304 COURSE NAME: COMPILER OPTIMIZATION TECHNIQUES	
CO1	Identify the different optimization techniques that are possible for a sequence of code
CO2	Design performance enhancing optimization techniques
CO3	Manage procedures with optimal overheads
CO4	Understand modern programming language features and constructs
CO5	Learn to work on a larger software project

COURSE CODE : 20CP2305 COURSE NAME: DISTRIBUTED OPERATING SYSTEMS	
CO1	Identify the features of distributed operating systems.
CO2	Demonstrate the various protocols of distributed operating systems.
CO3	Identify the different features of real time operating systems.
CO4	Discuss the features of mobile operating systems.
CO5	Discuss the features of cloud operating systems.

COURSE CODE : 20CP2306 COURSE NAME: SOFTWARE PROCESS AND PROJECT MANAGEMENT	
CO1	Explain software development life cycle
CO2	Elicit functional and quality requirements
CO3	Perform trade-off among conflicting requirements
CO4	Estimate the efforts required for software development
CO5	Control the artifacts during software development

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AUDIT COURSE II

COURSE CODE : 20AC2091 COURSE NAME: VALUE EDUCATION	
CO1	Students will understand the importance of value based living
CO2	Students will gain deeper understanding about the purpose of their life
CO3	Students will understand and start applying the essential steps to become good leaders
CO4	Students will emerge as responsible citizens with clear conviction to practice values and ethics in life
CO5	Students will become value based professionals and building a healthy nation

COURSE CODE : 20AC2092 COURSE NAME: STRESS MANAGEMENT BY YOGA	
CO1	Develop healthy mind in a healthy body thus improving social health also
CO2	Improve efficiency
CO3	The student will apply forces and exert themselves using rarely used muscle groups

COURSE CODE : 20AC2093 COURSE NAME: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	
CO1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
CO2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity
CO3	Study of Neet is hatakam will help in developing versatile personality of students.

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COURSE OUTCOMES (COs)

SEMESTER III

COURSE CODE : 20CP3301 COURSE NAME: BIG DATA COMPUTING (NPTEL)

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CO1	Understand the Big Data and Hadoop
CO2	Understand the Big Data Platform
CO3	Understand the Big data streaming platform for fast Data
CO4	Explore the Machine learning
CO5	Illustrate Various Big Data applications

PROFESSIONAL ELECTIVE - III

COURSE CODE : 20CP3302 COURSE NAME: IMAGE PROCESSING AND ANALYSIS	
CO1	Analyze general terminology of digital image processing.
CO2	Examine various types of images, intensity transformations and spatial filtering.
CO3	Develop Fourier transform for image processing in frequency domain
CO4	Evaluate the methodologies for image segmentation, restoration etc.
CO5	Implement image process and analysis algorithm

COURSE CODE : 20CP3303 COURSE NAME: DATA MINING TECHNIQUES	
CO1	Evolve multidimensional intelligent model from typical system.
CO2	Discover the knowledge imbibed in the high dimensional system and gain knowledge on dataware house process.
CO3	Acquire knowledge of data processing and data quality.
CO4	Design and deploy classification and clustering techniques.
CO5	Evaluate various mining techniques on complex data objects.

PROFESSIONAL ELECTIVE - IV

COURSE CODE : 20CP3304 COURSE NAME: DEEP LEARNING TECHNIQUES	
CO1	Understand the role of Deep learning in Machine Learning Applications.
CO2	To get familiar with the use of TensorFlow/Keras in Deep Learning Applications.
CO3	To design and implement Deep Learning Applications.
CO4	Critically Analyse Different Deep Learning Models in Image Related Projects.
CO5	To design and implement Convolutional Neural Networks, To know about applications of Deep Learning in NLP and Image Processing.

COURSE CODE : 20CP3305 COURSE NAME: SOFT COMPUTING TECHNIQUES	
CO1	Differentiate Conventional AI and Computational Intelligence.
CO2	Discuss on machine learning through neural networks.
CO3	Apply knowledge in developing a Fuzzy expert system.

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CO4	Model Neuro Fuzzy system for clustering and classification.
CO5	Discover knowledge to develop Genetic Algorithm and Support vector machine based machine learning system

PROFESSIONAL ELECTIVE - V

COURSE CODE : 20CP3306 COURSE NAME: LINGUISTIC COMPUTING	
CO1	To tag a given text with basic Language features
CO2	To design an innovative application using NLP components
CO3	To implement a rule based system to tackle morphology/syntax of a language
CO4	To design a tag set to be used for statistical processing for real-time applications
CO5	To compare and contrast use of different statistical approaches for different types of NLP applications

COURSE CODE : 20CP3307 COURSE NAME: ADVANCED CRYPTOGRAPHY TECHNIQUES	
CO1	Demonstrate the various classical encryption techniques and the adversary capabilities.
CO2	Apply computational secrecy and semantic security to find out the probability of how strong are the security schemes.
CO3	Illustrate the various MAC and HASH functions and apply the Birthday attack over Hash.
CO4	Apply number theory in public key encryption techniques.
CO5	Analyze the application of cryptography for secure E-Commerce and other secret transactions.

OPRN ELECTIVE - II

COURSE CODE : 20CP3401 COURSE NAME: DATA SCIENCE FOR ENGINEERS	
CO1	Describe a flow process for data science problems
CO2	Classify data science problems into standard typology
CO3	Develop R codes for data science solutions0.....
CO4	Correlate results to the solution approach followed
CO5	Assess the solution approach

COURSE CODE : 20CP3402 COURSE NAME: CYBER SECURITY	
CO1	Analytical skills
CO2	Group / team working
CO3	Innovation / creativity
CO4	Problem solving skills
CO5	Research

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)**

DEPARTMENT NAME	MECHANICAL ENGINEERING
PROGRAMME NAME	M.E. (CAD/CAM)
REGULATIONS	R2020

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO1	Graduates able to apply technical expertise and skills to face Industrial challenges.
PEO2	Graduates able to design create and innovate economically, environment-friendly and technically feasible products with social acceptance.
PEO3	Graduates able to exhibit professionalism in their profession with good communication, ethics and entrepreneurship skills to meet the social challenges.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

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 modeling 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

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	the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability:Understand the impact of the professional engineering solutions in societal andenvironmental 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.
PO 11	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.
PO 12	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.

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COURSE OUTCOMES (COs)

PROGRAM NAME: M.E. (CAD/CAM)

Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSECODE: 20MA1104 COURSE NAME: APPLIED MATHEMATICS FOR ENGINEERS	
CO1	Students will able to know about Estimation theory, computational methods.
CO2	Able to use Ordinary and partial differential equations in real time problems.
CO3	It helps the students to get familiarized finite element method & simulation modeling
CO4	Able to solve Cubic spline interpolation and Bezier curves.
CO5	It helps the students to get familiarized numerical integration

COURSE CODE: 20CC1201 COURSE NAME: COMPUTER AIDED DESIGN	
CO1	Understand the concepts of wireframe, surface and solid modeling.
CO2	Assemble and create the mechanisms of components.
CO3	Familiarize in the concepts of geometric Dimensioning and Tolerance.
CO4	Execute the techniques of assemblage and animation.
CO5	Implement the concepts in applications of Design.

COURSE CODE: 20CC1202 COURSE NAME: INTEGRATED MECHANICAL DESIGN COMMON TO ALL BRANCHES	
CO1	Understand the concepts of shaft and brake.
CO2	Design gear and gearbox components.
CO3	Understand the Integrated Design of Mechanical systems and Machines.
CO4	Execute the principles in real time problems.
CO5	Implement the concepts in automobile and automation components.

COURSECODE: 20CC1203 COURSE NAME: COMPUTER AIDED MANUFACTURING	
CO1	Select the appropriate code for performing particular task in a CNC machine.

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CO2	Acquire the knowledge about constructional features of CNC machines.
CO3	Prepare the program for Turning and Milling operations.
CO4	Implement the Numerical control techniques in CNC machines.
CO5	Develop skills in tool path simulation, generation of NC code

COURSE CODE: 20RM1153 **COURSE NAME: RESEARCH METHODOLOGY AND IPR**	
CO1	Ability to formulate research problem
CO2	Ability to carry out research analysis
CO3	Ability to follow research ethics
CO4	Ability to understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
CO5	Ability to understand about IPR and filing patents in R & D.

COURSECODE: 20CC1001 **COURSE NAME: COMPUTER AIDED DESIGN LAB**	
CO1	Design the given machine components.
CO2	Assemble the machine components.
CO3	Detailing the given machine components.
CO4	Simulate the machine components.
CO5	know the concepts of modeling techniques.

COURSE CODE: 20CC1002 **COURSE NAME: COMPUTER AIDED MANUFACTURING LABORATORY**	
CO1	Tool and machine setting.
CO2	CNC programming and tool path simulation.
CO3	Maintenance of CNC lathe and milling machine.
CO4	Hands on experience in CMM and RPT.
CO5	NC code generation.

COURSECODE: 20AC1091 **COURSE NAME: ENGLISH FOR RESEARCH PAPER**	
CO1	Understand that how to improve your writing skills and level of readability
CO2	Learn about what to write in each section
CO3	Understand the skills needed when writing a Title
CO4	Understand the skills needed when writing the Conclusion
CO5	Ensure the good quality of paper at very first-time submission

COURSECODE: 20AC1092 **COURSE NAME: DISASTER MANAGEMENT**	
CO1	Ability to summarize basics of disaster
CO2	Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.

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CO3	Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO4	Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO5	Ability to develop the strengths and weaknesses of disaster management approaches

COURSECODE: 20AC1093 **COURSE NAME: SANSKRIT FOR TECHNICAL**	
CO1	Understanding basic Sanskrit language.
CO2	Write sentences.
CO3	Know the order and roots of Sanskrit.
CO4	Know about technical information about Sanskrit literature.
CO5	Understand the technical concepts of Engineering.

COURSECODE: 20AC1094 **NAME: CONSTITUTION OF INDIAKNOWLEDGE**	
CO1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO2	Discuss the intellectual origins of the framework of argument that informed the Conceptualization
CO3	Approach of social reforms leading to revolution in India.
CO4	Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP].
CO5	Discuss the passage of the Hindu Code Bill of 1956.

COURSECODE: 20AC1095 **COURSE NAME: PEDAGOGY STUDIES**	
CO1	What pedagogical practices are being used by teachers informal and informal classrooms in developing countries?
CO2	What is the evidence on the effectiveness of these pedagogical practices, in what conditions and with what population of learners?
CO3	How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

SEMESTER II

COURSECODE: 20CC2201

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COURSE NAME: FINITE ELEMENT ANALYSIS	
CO1	Develop Skills to select and use finite elements for different field problems like complex structure, heat transfer, vibration and fluid flow applications.
CO2	Acquire knowledge in one and two dimensional solutions.
CO3	Implement the FEM techniques in application packages such as ANSYS and DEFORM.
CO4	Create code for one dimensional analysis.
CO5	Execute the principles in real time problems.

COURSE CODE: 20CC2202 COURSE NAME: INTEGRATED PRODUCT DESIGN AND PROCESSES DEVELOPMENT	
CO1	Define Integrated Product Teams, states their purpose, and describes how they are used to implement the concept of Integrated Product and Process Development.
CO2	Define Integrated Product and Process Development and describes the successful use of Integrated Product Teams by government Program Managers.
CO3	Acquire knowledge about product architecture.
CO4	Know the industrial design and robust design techniques.
CO5	Execute the needs of the customer in global market.

COURSECODE: 20CC2203 COURSE NAME: DESIGN FOR MANUFACTURE ASSEMBLY AND ENVIRONMENTS	
CO1	Material selection based on Design, manufacturing process and assembly.
CO2	Application of DFMA tools for minimizing cost in manufacturing and efforts.
CO3	Designing of components based on environmental Factors.
CO4	Considerations in machining and casting to facilitate easy manufacturing.
CO5	Execute the principles in real time problems.

COURSECODE: 20CC2001 COURSE NAME: COMPUTER AIDED ENGINEERING LAB	
CO1	Select the method, meshing, analysis and optimize the given problem for structural, heat transfer and couple field applications.
CO2	Familiarize the concepts of simulation techniques.
CO3	Implement the techniques in real-time problems.
CO4	Prepare the report of finite element results.
CO5	Expose with various simulation software's.

COURSECODE: 20CC2002 COURSE NAME: INPLANT TRAINING / INTERNSHIP	
CO1	Describe structure of the Industrial organization.
CO2	Realize the various functions of management.

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CO3	Understanding of groups and group dynamics.
CO4	Describe the industrial culture.
CO5	Develop skills to read, write and comprehend

COURSECODE: 20CC2303 COURSE NAME: COMPUTER INTEGRATED PRODUCTION AND INVENTORY SYSTEMS ASSEMBLY AND ENVIRONMENTS	
CO1	Improve knowledge in failure modes and effect analysis.
CO2	Improve knowledge in accelerated testing concept.
CO3	Increase the software skill in reliability.
CO4	Prepare resource planning activities.
CO5	Execute the process control methods in industries

COURSECODE: 20CC2301 COURSE NAME: COMPUTER AIDED PROCESS PLANNING	
CO1	Identify the process capabilities, such as process parameters, process boundaries, process performance and process cost in the areas of machining, mechanical and electronic assembly and circuit boards manufacturing.
CO2	Learn manual and computer aided process planning systems based on process planning criteria and implementation of economic considerations.
CO3	Prepare the Generative and Variant process planning approach.
CO4	Develop skills in preparing Decision table and decision trees.
CO5	Implement planning techniques with the help of MIPLAN, AUTOPLAN and PRO.

COURSECODE: 20CC2302 COURSE NAME: ADDITIVE MANUFACTURING	
CO1	Capability of creating two-dimensional and three-dimensional products and designs using appropriate tools, materials, methods and techniques.
CO2	Skill of applying prototype model in various disciplines.
CO3	Reverse engineering techniques.
CO4	Concepts of solid, liquid and powder based additive manufacturing systems.
CO5	Prototypes by using 3D printing, SDM and BPM additive manufacturing systems.

COURSECODE: 20CC2304 COURSE NAME: DESIGN AND ANALYSIS OF EXPERIMENTS

CO1	Critically review basic concepts and models of experimental design.
CO2	Analyze the results of a designed experiment in order to conduct the appropriate statistical analysis of the data.
CO3	Interpret statistical results from an experiment and report them in non-technical language.
CO4	Prepare new solutions for existing issues.
CO5	Execute various method of solution in different areas.

COURSECODE: 20CC2305 **COURSE NAME: METROLOGY AND NON DESTRUCTIVE TESTING**	
CO1	The student shall be able to understand the concept of Laser Metrology and Computer Integrated
CO2	Machining Machine.
CO3	The student shall be able to understand the techniques used in statistical quality control.
CO4	The student shall be able to analysis the materials characteristics through various non-destructive tests.
CO5	The student shall be able to understand the knowledge various radiography characteristics and operations.

COURSECODE: 20CC2306 **COURSE NAME: COMPETITIVE MANUFACTURING SYSTEMS**	
CO1	Students can understand the concept of various Production and flexible manufacturing systems.
CO2	Enhance the ability of students to create GT code for a given product and differentiate the different types of products.
CO3	Create capability to manufacture different products with minimum defects using lean principles.
CO4	Student can understand the concepts of Just in time and Green Manufacturing approach.
CO5	Able to prepare a well planned schedule for production in industries.

COURSECODE: 20CC2307 **COURSE NAME: DESIGN OF HEAT EXCHANGER**	
CO1	Understand the Industrial applications of heat exchangers.
CO2	Design the process heat exchanger.
CO3	Design the cooling towers, condensers, and evaporators.
CO4	To perform flow and stress analysis.
CO5	To do thermal design including phase change heat transfer.

COURSECODE: 20CC2308 COURSE NAME: COMPOSITE MATERIALS AND MECHANISMS	
CO1	Able to analyses the fiber reinforced Laminate for optimum design.
CO2	Apply classical laminate theory to study and analyses the residual stresses in Laminate.
CO3	To familiarize the concepts of Thermal Analysis.
CO4	To Implement various analyses in the real time problems.
CO5	To execute mechanisms of various Manufacturing Processes.

AUDIT COURSES (AC) - SEMESTER II

COURSECODE: 20AC2091 COURSE NAME: VALUE EDUCATION	
CO1	Knowledge of self-development.
CO2	Learn the importance of Human values.
CO3	Developing the overall personality

COURSECODE: 20AC2092 COURSE NAME: STRESS MANAGEMENT BY YOGA	
CO1	Develop healthy mind in a healthy body thus improving social health also
CO2	Improve efficiency

COURSE CODE: 20AC2093 COURSE NAME: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	
CO1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
CO2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity.
CO3	Study of Neet is hatakam will help in developing versatile personality of students.

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COURSE OUTCOMES (COs)

SEMESTER III

COURSECODE: 20CC3901 COURSE NAME: DISSERTATION- I	
CO1	Identify a problem in the field of Mechanical Engineering and provide solutions, which are technically, economically and environmentally feasible.
CO2	Know ledged the students in preparing a project reports, presentations to face the reviews and final university viva examinations.
CO3	Improved the experience and confidence level in a particular domain.

SEMESTER III - ELECTIVE III

COURSE CODE: 20CC3301 COURSE NAME: MECHATRONICS APPLICATIONS IN MANUFACTURING – I	
CO1	Imply the knowledge to study the mechatronics in modern manufacturing systems.
CO2	Identify and select the sensors and transducers based on the application.
CO3	Identify the principles and functions of drives and actuators.
CO4	Get knowledge of microprocessor and microcontrollers and its functions.
CO5	Apply the knowledge about integration of mechatronic systems in manufacturing.

COURSE CODE: 20CC3302 COURSE NAME: INDUSTRIAL SAFETY MANAGEMENT	
CO1	Process safety management (PSM).
CO2	Maintenance principles and procedures.
CO3	Inspection engineering principles, procedures and instruments.
CO4	Safety in laboratories.
CO5	Hazards due to noise principles, measurement, safe limits and protective.

COURSE CODE: 20CC3303

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COURSE NAME: SUPPLY CHAIN MANAGEMENT	
CO1	At the end of this course the student should be able to manage logistics and supply chain of a factory or an organization.
CO2	Solving supplier's problems and beyond level.
CO3	Minimizing variance by means of activities like standardization, variety reduction, etc.
CO4	Attain Minimum total cost of operation & procurement.
CO5	Achieving maximum efficiency in using labour, capital & plant through the company

COURSE CODE: 20CC3304 COURSE NAME: INDUSTRIAL ROBOTICS AND EXPERT SYSTEMS	
CO1	Understand about robot kinematics and dynamics.
CO2	Write basic program to control robot.
CO3	Understand about various sensors used in robotics field.
CO4	Prepare robot cell layout.
CO5	Execute the mechanism of robots.

COURSE CODE:20CC3305 COURSE NAME: COMPUTATIONAL FLUID DYNAMICS	
CO1	Understand about compressible and incompressible flow fluids.
CO2	Select the governing equations for conduction and convection fluid flow applications.
CO3	Acquire knowledge about grid generation, processing and applications of CFD.
CO4	Develop skills in finite element modeling techniques.
CO5	Execute the principles in real time thermal and fluid problems.

COURSE CODE: 20CC3306 COURSE NAME: VIBRATION ANALYSIS AND CONTROL	
CO1	Detect the problem of machine tool vibration.
CO2	Analyze the problem to get rid of any machine vibration trouble.
CO3	Attain the vibration control methods.
CO4	Develop skills on experimental methods.
CO5	Execute the principles in real time vibration problems.

COURSE CODE: 20CC3307 COURSE NAME: OPTIMIZATION TECHNIQUES IN DESIGN	
CO1	Formulate unconstrained optimization techniques in engineering design application.
CO2	Formulate constrained optimization techniques for various application.
CO3	Apply genetic algorithms to combinatorial optimization problems.

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CO4	Evaluate solutions by various static application design problem.

COURSE CODE: 20CC3308 **COURSE NAME: TRIBOLOGY IN DESIGN**	
CO1	Apply in long life product development areas.
CO2	Strengthen the skills in failure analysis and condition monitoring.
CO3	Acquire the knowledge of various lubrication techniques.
CO4	Calculate the friction, load and flow occurrence level over components.
CO5	Execute the Laser methods in the engineering field.

COURSECODE: 20CC3309 **COURSE NAME: ADVANCED TOOL DESIGN**	
CO1	Develop knowledge about cutting tools.
CO2	Design Jigs & fixtures.
CO3	Dies & Press tools for conventional & CNC machines.
CO4	Know about the tool holding methods, Automatic tool changers and tool petitioners.
CO5	Execute the principles in real time problems.

COURSE CODE: 20CC3311 **COURSE NAME: DESIGN AND ANALYSIS OF THERMAL ENERGY SYSTEMS**	
CO1	Understand concepts of basic design principles of thermal equipments.
CO2	Modeling and analysis of thermal systems.
CO3	Design and analysis of heat transfer equipments
CO4	Evalute the fluid flow performance calculations
CO5	Optimization concerning design of thermal systems

COURSE CODE: 20CC3312 **COURSE NAME: BASICS AND APPLICATIONS FOR INTERNET OF THINGS**	
CO1	Understand the vision of IoT from a global context.
CO2	Determine the Market perspective of IoT.
CO3	Use of Devices, Gateways and Data Management in IoT.
CO4	Build state of the art architecture in IoT.
CO5	Apply of IoT in Industrial and Commercial Building Automation and Real World Design Constraints.

COURSE CODE: 20CC3401 **COURSE NAME: MICRO ELECTRO MECHANICAL SYSTEMS**	
CO1	Understand the principles of Microsystems.
CO2	Identify the fabrication process and its materials.
CO3	Gain knowledge about structural and thermal micromechanics.
CO4	To analyze the micro system manufacturing.

CO5	Able to explain the design principles of Micro system techniques

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SEMESTER IV

COURSECODE: 20CC4901 **COURSE NAME: DISSERTATION- II**	
CO1	Identify a problem in the field of Mechanical Engineering and provide solutions, which are technically, economically and environmentally feasible.
CO2	Know ledged the students in preparing a project reports, presentations to face the reviews and final university viva examinations.
CO3	Improved the experience and confidence level in a particular domain.

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	DEPARTMENT OF ELECTRONICS AND COMMUNICATION
PROGRAMME NAME	M.E EMBEDDED SYSTEMS
REGULATIONS	R-2020

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO 1	To prepare the graduates to solve, analyze and develop real time engineering products by providing strong foundation in the fundamentals of Electronics and Communication Engineering
PEO 2	To prepare the graduates to succeed in multidisciplinary dimensions by providing adequate trainings and exposure to emerging technologies
PEO 3	To prepare the graduates to become a successful leader and innovator following ethics with the sense of social responsibility for providing engineering solutions

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

PO 1	**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 considerations for the public health and safety, and the cultural, societal and environmental consideration.
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.
PO 9	**INDIVIDUAL AND TEAM WORK**: Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
PO 10	**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 environment.
PO 12	**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.

HICET

COURSE OUTCOMES (COs)

PROGRAM NAME – M.E EMBEDDED SYSTEMS

Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSE CODE : 20MA1105 COURSE NAME: ADVANCED MATHEMATICS FOR ELECTRICAL ENGINEERING	
CO1	Apply various methods to solve system of linear equations.
CO2	Apply matrix theory in Electrical Engineering problems.
CO3	Apply the knowledge of linear programming problem.
CO4	Apply the concept of power spectral density functions.
CO5	Apply the fundamental knowledge of the Markov and Poisson processes

COURSE CODE : 20ES1201 COURSE NAME: ADVANCED DIGITAL SYSTEM DESIGN	
CO1	Design and analysis of sequential circuit.
CO2	Design and analysis of asynchronous sequential circuit.
CO3	Explore fault diagnosis and testability algorithm
CO4	Learn of programmable logic devices.
CO5	Design and analysis of hardware description languages

COURSE CODE : 20ES1202 COURSE NAME: EMBEDDED SYSTEMS DESIGN	
CO1	Identify the various embedded system design
CO2	Evaluate the general and single purpose processors
CO3	Compare various bus structures
CO4	Recognize the process models
CO5	Apply the embedded software development tools

COURSE CODE : 20ES1203 COURSE NAME: MICROCONTROLLER BASED SYSTEM DESIGN	
CO1	8-bit microcontrollers, learn assembly and C-programming of PIC.
CO2	Learn Interfacing of Microcontroller.
CO3	Learners will study about PIC microcontroller and system design.
CO4	The course would enable students to enrich their knowledge with hands on experiments and project based learning
CO5	Effectively utilize microcontroller software development tools such as a compiler, make files, or compile scripts

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COURSE CODE : 20ES1204 COURSE NAME: SOFTWARE FOR EMBEDDED SYSTEMS	
CO1	Ability to use GNUC to develop embedded software.
CO2	Knowledge and understanding of fundamental embedded systems design paradigms, architectures, possibilities and challenges, both with respect to software and hardware
CO3	Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in embedded systems design

COURSE CODE : 20ES1001 COURSE NAME: EMBEDDED CONTROLLERS LABORATORY	
CO1	Ability to use GNUC to develop embedded software.
CO2	Knowledge and understanding of fundamental embedded systems design paradigms, architectures, possibilities and challenges, both with respect to software and hardware
CO3	Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in embedded systems design

COURSE CODE : 20ES1701 COURSE NAME: TECHNICAL SEMINAR	
CO1	Prepare and present a topic on engineering subjects
CO2	Prepare and present general topics effectively with good communication skills
CO3	Categorize the available teaching aids and use them in their presentations.
CO4	Discuss their ideas with confidence.
CO5	Transfer their technical or general knowledge to others with confidence.

COURSE CODE : 20ES2201 COURSE NAME: REAL TIME OPERATING SYSTEM	
CO1	Explain the operating system structures and types.
CO2	Insight into scheduling, disciplining of various processes execution.
CO3	Describe the various RTOS support modelling
CO4	Explain the commercial RTOS Suite features to work on real time Processes design.
CO5	Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in RTOS and embedded automation design

COURSE CODE : 20ES2202 COURSE NAME: INTERNET OF THINGS	
CO1	Understand and Develop on the basic's concepts ofIoT and its present developments.

CO2	Identify the IoT structures and components related to IoT.
CO3	Infer the protocols that associated with IoT.
CO4	Develop and apply the platform for IoT in data analytics and its services or attributes.
CO5	Discover the smart applications and control used by IoT

COURSE CODE : 20ES2001 COURSE NAME: REAL TIME AND EMBEDDED SYSTEM LABORATORY	
CO1	Identify the various embedded system design
CO2	Evaluate the general and input and output interfacing
CO3	Compare various microcontrollers
CO4	Recognize the real time application
CO5	Apply the real time software development tools

COURSE CODE : 20ES3901 COURSE NAME: DISSERTATION - I	
CO1	Realize the skills acquired in the previous semesters to solve complex engineering problems.
CO2	Build up an innovative model / prototype of an idea related to the field of specialization.
CO3	Create the work individually to identify, troubleshoot and build products for environmental and Societal issues.
CO4	Effective presentation of ideas with clarity.
CO5	Evaluate surveys towards developing a product, which helps in lifetime learning

COURSE CODE : 20ES4901 COURSE NAME: DISSERTATION - II	
CO1	Realize the skills acquired in the previous semesters to solve complex engineering problems.
CO2	Build up an innovative model / prototype of an idea related to the field of specialization.
CO3	Create the work individually to identify, troubleshoot and build products for environmental and Societal issues.
CO4	Effective presentation of ideas with clarity.
CO5	Evaluate surveys towards developing a product, which helps in lifetime learning

COURSE CODE : 20ES2301 COURSE NAME: ADVANCED DIGITAL SIGNAL PROCESSING	
CO1	Identify various arithmetic and geometrical operations for random signals.
CO2	Analyze the spectrum estimation.
CO3	Analyze linear estimation and Prediction.
CO4	Design the adaptive Filters.
CO5	Analyze the multirate digital signal processing

COURSE CODE : 20ES2302 COURSE NAME: RESEARCH METHODOLOGY	
CO1	Observe the various approaches to do research.
CO2	Carryout the research design.
CO3	Evaluate the data collection for research activities.
CO4	Acknowledge the function of Multivariate Analysis Techniques
CO5	Organize the research activity systematically and prepare research report effectively

COURSE CODE : 20ES2303 COURSE NAME: DIGITAL IMAGE PROCESSING	
CO1	Ability to understand the fundamentals of image processing.
CO2	Able to understand the techniques involved in image enhancement.
CO3	Ability to gain the knowledge about image compression.
CO4	Ability to learn the fundamentals of image compression.
CO5	Ability to Formulate hardware for image processing applications

COURSE CODE : 20ES2304 COURSE NAME: COMPUTER ARCHITECTURE AND PARALLEL PROCESSING	
CO1	Design and analysis of computer architecture and performance.
CO2	Learn the difference between pipeline and parallel processing concepts.
CO3	Analysis of Memory Technology and Optimization
CO4	Learn the distribution of shared memory architectures.
CO5	Design and analysis of multi core architecture

COURSE CODE : 20ES2305 COURSE NAME: EMBEDDED LINUX	
CO1	To use Linux desktop and GNU tool chain with Eclipse IDE
CO2	Cross compile Linux kernel and port it to target board.
CO3	Add applications and write customized application for the Linux kernel in the target board.
CO4	Students will study about distributions and cross platform tool chain.
CO5	ImprovedEmployabilityandentrepreneurshipcapacityduetoknowledgeupgradationonrecenttrends in embedded systems design.

COURSE CODE : 20ES2306 COURSE NAME: ROBOTICS AND CONTROL	
CO1	Ability to understand the components and basic terminology of Robotics
CO2	Able to calculate the forward kinematics and inverse kinematics of serial and parallel robots.
CO3	Able to calculate the Jacobian for robot and to do the path planning for a robotic system
CO4	Able to develop dynamic modelling

CO5	Able to perform robot control system

COURSE CODE : 20ES2307 **COURSE NAME: ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY**	
CO1	Real world EMC deigns constraints and to achieve the most cost effective design that meets all requirements.
CO2	Diagnose and solve the basic electromagnetic compatibility problems.
CO3	Designing the electronic system that function without errors or problems that are related to electromagnetic compatibility.
CO4	Measuring the EMI with various methods and comparing it with standards.
CO5	Controlling techniques for EMI and EMC.

COURSE CODE : 20ES2308 **COURSE NAME: PYTHON PROGRAMMING**	
CO1	Students will be able to develop skill in system administration and network programming by learning Python.
CO2	Students will also learn how to effectively use Python's very powerful processing primitives, modelling etc Able to Implement database and GUI applications.
CO3	Students will be able to design object-oriented programs with Python classes
CO4	Able to Implement database and GUI applications.
CO5	Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in embedded systems design

COURSE CODE : 20ES2309 **COURSE NAME: AUTOMOTIVE EMBEDDED SYSTEM**	
CO1	Design and develop automotive embedded systems.
CO2	Analyze various embedded products used in automotive industry
CO3	Evaluate the opportunities involving technology, a product or a service required for developing a start up idea used for automotive applications
CO4	Improved Employability and entrepreneurship capacity due to knowledge upgradation on recent trends in embedded systems design

COURSE CODE : 20ES2310 **COURSE NAME: ASIC AND FPGA DESIGN**	
CO1	Students will develop more understanding on the concepts of ASIC
CO2	Students will understand the Design, partitioning, floor planning, placement and routing in ASIC

CO3	Students will study about different logic synthesis, simulation and testing technologies in ASIC
CO4	Students will acquire knowledge about different types of FPGA
CO5	Students will learn System diagnostic standards and regulation requirements

PROFESSIONAL ELECTIVE IV & V

COURSE CODE : 20ES3301 COURSE NAME: SMART SENSORS	
CO1	Ability to understand the components and basic terminology of sensors.
CO2	Ability to understand the operation of different types of sensors and Microsystems
CO3	Ability to select the smart sensors for practical applications.
CO4	Ability to design sensor based Microsystems
CO5	Ability to emphasis on the integration of electronics with sensors

COURSE CODE : 20ES3302 COURSE NAME: EMBEDDED NETWORKING AND AUTOMATION OF ELECTRICAL SYSTEM	
CO1	Comprehend the fundamentals of Embedded Networking by using different types of buses
CO2	The learning process delivers insight into wireless embedded networking
CO3	Improved Employability and entrepreneurship capacity due to knowledge upgradation on recent trends in embedded building system automation.
CO4	Able to apply knowledge from measurement and embedded control of electrical apparatus
CO5	Be capable of developing the communication for large electrical system automation

COURSE CODE : 20ES3303 COURSE NAME: SOFT COMPUTING AND OPTIMIZATION TECHNIQUES	
CO1	Comprehend the fundamentals of artificial neural network, fuzzy systems and optimization techniques
CO2	Understand the significance of various optimization algorithms applied to engineering problems.
CO3	Be capable of developing ANN-based models
CO4	Be capable of choosing appropriate optimization techniques for engineering applications
CO5	Reveal different applications of these models to solve engineering and other problems.

COURSE CODE : 20ES3304 COURSE NAME: WIRELESS AND MOBILE COMMUNICATION

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CO1	Knowledge of basic and advanced theories on wireless communications systems in physical, link and network layer.
CO2	Ability to understand, model, an design mobile networks.
CO3	Ability to understand and apply mathematically model in wireless communications.
CO4	Wireless communication transceiver algorithm design
CO5	Mobile system design methodology, link level simulation for wireless communications.

COURSE CODE : 20ES3305 **COURSE NAME: ELECTRIC VEHICLES AND POWER MANAGEMENT**	
CO1	Learners will understand the operation of Electric vehicles and various energy storage technologies for electrical vehicles

COURSE CODE : 20ES3306 **COURSE NAME: DISTRIBUTED EMBEDDED COMPUTING**	
CO1	Ability to apply knowledge to identify, formulate communication systems.
CO2	Ability to understand and integrate new knowledge within the field and advanced technical knowledge in multiple contexts.
CO3	Ability to Improve the Employability and entrepreneurship capacity
CO4	Ability to solve novel advanced electronics engineering along with soft computing problems that require advanced knowledge within the field.
CO5	Ability to knowledge up gradation on recent trends in embedded systems design

COURSE CODE : 20ES3307 **COURSE NAME: MULTICORE ARCHITECTURE**	
CO1	Ability to understand the multicore within chip level design
CO2	Ability to develop a programming model for implementing multiprocessing environment.
CO3	Ability to understand various processors with multicore capabilities
CO4	Ability to analyze power PC architecture.
CO5	Ability to develop the programming for core processors.

COURSE CODE : 20ES3401 **COURSE NAME: SMART GRID**	
CO1	Learners will develop more understanding on the concepts of Smart Grid and its present developments
CO2	Learners will study about different Smart Grid technologies.
CO3	Learners will acquire knowledge about different smart meters and advanced

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COURSE CODE : 20ES3402 COURSE NAME: NANO ELECTRONICS	
CO1	Students will understand the electronic device fabrication
CO2	The students should be able to understand basic and advanced concepts of nano electronic devices, Sensors and transducers and their applications in nanotechnology
CO3	The concepts of aquantum well, quantum transport and tunnelling effects.
CO4	: Understand the impact of nano electronics onto information technology, communication and computer science
CO5	Design integrated circuits (microchip) using state-of-the-art CMOS technology.

COURSE CODE : 20AC1091 COURSE NAME: ENGLISH FOR RESEARCH PAPER WRITING	
CO1	Understand that how to improve your writing skills and level of readability
CO2	Learn about what to write in each section
CO3	Understand the skills needed when writing a Title
CO4	Understand the skills needed when writing the Conclusion
CO5	Ensure the good quality of paper at very first-time submission

COURSE CODE : 20AC1092 COURSE NAME: DISASTER MANAGEMENT	
CO1	Ability to summarize basics of disaster
CO2	Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response
CO3	Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives
CO4	Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations
CO5	Ability to develop the strengths and weaknesses of disaster management approaches

COURSE CODE : 20AC1093 COURSE NAME: SANSKRIT FOR TECHNICAL KNOWLEDGE	
CO1	Ability to summarize basics of disaster
CO2	Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response
CO3	Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives

CO4	Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations
CO5	Ability to develop the strengths and weaknesses of disaster management approaches

COURSE CODE : 20AC1094 **COURSE NAME: VALUE EDUCATION**	
CO1	Students will understand the importance of value based living.
CO2	Students will gain deeper understanding about the purpose of their life.
CO3	Students will understand and start applying the essential steps to become good leaders.
CO4	Students will emerge as responsible citizens with clear conviction to practice values and ethics in life.
CO5	Students will become value based professionals and building a healthy nation.

COURSE CODE : 20AC1095 **COURSE NAME: CONSTITUTION OF INDIA**	
CO1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics
CO2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India
CO3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leadership of Jawaharlal Nehru
CO4	The eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
CO5	Discuss the passage of the Hindu Code Bill of 1956.

COURSE CODE : 20AC2091 **COURSE NAME: PEDAGOGY STUDIES**	
CO1	What pedagogical practices are being used by teachers informal and informal classrooms in developing countries?
CO2	What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
CO3	How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
CO4	How can teacher to develop their Professional development support effective pedagogy?

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CO5	How can improve the Research and Future Direction using effective pedagogy.

COURSE CODE : 20AC2092 **COURSE NAME: STRESS MANAGEMENT BY YOGA**	
CO1	Develop healthy mind in a healthy body thus improving social health also
CO2	Improve efficiency
CO3	The student will apply forces and exert themselves using rarely used muscle groups

COURSE CODE : 20AC2093 **COURSE NAME: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS**	
CO1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
CO2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity
CO3	Study of Neet is hatakam will help in developing versatile personality of students.

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

DEPARTMENT NAME	DEPARTMENT OF MANAGEMENT SCIENCES
PROGRAMME NAME	MASTER OF BUSINESS ADMINISTRATION
REGULATIONS	R-2020

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO 1	Enable students to learn and understand business concepts, terminologies, models and perspectives
PEO 2	Students will establish themselves as effective management professional by solving real problems by using management science knowledge along with practices in the skills of effective communication, critical thinking, team work and problem solving skills
PEO 3	Students will use professional management skills to get employment or pursue entrepreneurship career along with lifelong learning in advanced areas of management related fields
PEO 4	Students will be prepared to achieve excellence in leadership roles through participation in various activities of the program
PEO 5	Incorporate ethical considerations while decision making and instill the importance of social responsibility

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

PO 1	Ability to apply the business acumen gained in practice
PO2	Ability to understand and solve managerial issues
PO3	Ability to communicate and negotiate effectively, to achieve organizational and individual goals
PO4	Ability to upgrade their professional and managerial skills in their workplace
PO5	Ability to explore and reflect about managerial challenges, develop informed managerial decisions in a dynamically unstable environment
PO6	Ability to take up challenging assignments

PO7	Ability to understand one's own ability to set achievable targets and complete them
PO8	Ability to pursue lifelong learning
PO9	To have a fulfilling business career
PO10	Ability to have financial literacy
PO11	Ability to fulfill social outreach
PO12	Ability to understand business analytics

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COURSE OUTCOMES (COs)

PROGRAM NAME – MASTER OF BUSINESS ADMINISTRATION
Academic Year : 2021-2022
Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSE CODE :20BA1201 **COURSE NAME:BUSINESS ORGANIZATION AND MANAGEMENT**	
CO1	Understand and apply various forms of an organization
CO2	Understand the evolution of management functions
CO3	Understand the appropriate Strategies for an organization and display their managerial skills.
CO4	Understand and develop an organizational structure for an organization.
CO5	Understand the organizational performance and its applications

COURSE CODE :20BA1202 **COURSE NAME:MANAGERIAL ECONOMICS**	
CO1	Understand the key managerial economic concepts in business.
CO2	Remember and understand the vagaries of changes in the determinants of demand and supply
CO3	Understand and apply the production and cost concepts in business
CO4	Understand the market environment and prices through real time market visit
CO5	Understand the macroeconomic elements and its impact on the economy

COURSE CODE : 20BA1203 **COURSE NAME:ACCOUNTING FOR MANAGERS**	
CO1	Students will apply the basic accounting concepts and preparation of financial statements
CO2	Students will remember the various techniques in financial statement analysis
CO3	Students will remember the analysis of fund flow and cash flow and cost accounting technique in business
CO4	Students will apply the application of marginal costing techniques in business decisions
CO5	Students will understand the preparation and presentation of budgets in the modern business world

COURSE CODE : 20BA1204 **COURSE NAME:QUANTITATIVE METHODS FOR MANAGEMENT**

CO1	To Facilitate objective solutions in business decision making under subjective conditions
CO2	To Understand the concept of Random variables distribution functions
CO3	Understand the concept of Correlation and Regression
CO4	To Acquire skills in analyzing statistical methods
CO5	To Understand a clear perception of the statistical ideas and demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields

COURSE CODE :20BA1205 **COURSE NAME:ORGANIZATIONAL BEHAVIOR**	
CO1	Understand the components of the behaviour within organization
CO2	Understand the impact of individual behaviour on organization's performance
CO3	Understand the impact of individual behaviour on organization's performance
CO4	Apply leadership style based on situation and influences employee towards common goals and objectives
CO5	Understand the knowledge on various organization's aspects towards managing work and life.

COURSE CODE :20BA1206 **COURSE NAME:LEGAL ASPECTS OF BUSINESS**	
CO1	Remember the basics of Indian business law and Indian Contract Act
CO2	Remember the common forms of companies and Company Act 2013
CO3	Understand sale of goods act and legal aspects relating to business
CO4	Understand and Apply the fundamentals of Goods and Services tax
CO5	Remember the role of consumer rights and IPR in business

COURSE CODE :20BA1001 **COURSE NAME:BUSINESS APPLICATION LAB - I**	
CO1	Understand the excel basics and features in review menu
CO2	Apply referencing and knowledge about view menu
CO3	Understand and apply working with ranges and carryout formatting
CO4	Apply MS-Excel functions and auto filters in analyzing data
CO5	Understand advance filters and create charts

COURSE CODE : 20BA1002 **COURSE NAME:MANAGERIAL SKILLDEVELOPMENT-I**	
CO1	Apply listening skills in real world situations
CO2	Apply reading skills in real world situations
CO3	Apply and deliver logical messages to the audience confidently
CO4	Apply oral communication skills in real world situations
CO5	Apply written communication skills in drafting business messages

COURSE CODE :20BA1701 COURSE NAME: SOCIAL IMMERSION PROJECT	
CO1	Understand the various forms of non-profit organizations
CO2	Apply the cleanliness habits among individuals
CO3	Understand and educate the methods of self – handling and career guidance
CO4	Understand the importance of a better society
CO5	Apply the innovative techniques in social immersion projects

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COURSE OUTCOMES (COs)

SEMESTER II

COURSE CODE :20BA2201 COURSE NAME:OPERATIONS MANAGEMENT	
CO1	Understand the concept and challenges of operations management
CO2	Understand and apply the techniques of demand forecasting
CO3	Understand the various types of product design and process design
CO4	Understand the methods of material management
CO5	Understand the facility location models and project scheduling techniques

COURSE CODE : 20BA2202 COURSE NAME:FINANCIAL MANAGEMENT	
CO1	Remember the role of financial management and time value of money in business
CO2	Understand capital budgeting techniques and its applications
CO3	Remember the analysis of cost of capital and leverages
CO4	Understand and Apply decision of capital structure and distribution of dividend
CO5	Understand the working capital management and finance

COURSE CODE : 20BA2203 COURSE NAME:MARKETING MANAGEMENT	
CO1	Understand and apply product oriented knowledge in business or professional environment
CO2	Understand and apply marketing mix decisions
CO3	Remember and understand selling skills and try to experiment it.
CO4	Remember and understand consumer buying behavior.
CO5	Understand and apply the knowledge in writing reports on topics of marketing concepts.

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COURSE CODE :20BA2204 COURSE NAME: HUMAN RESOURCE MANAGEMENT	
CO1	Understand the role of human resources and interpreting the HR Policies towards the industries
CO2	Understand the skills needed for the recruitment and selection process towards the industries
CO3	Understand the modern needs of training and development
CO4	Understand the compensation plans at workplace
CO5	Understand the designing tools for performance appraisal

COURSE CODE :20BA2205 COURSE NAME: QUANTITATIVE TECHNIQUES	
CO1	To Acquire the basic concepts of LPP for solving mathematical problem will be useful in solving engineering problems
CO2	Be able to apply the simplex algorithm to solve a linear programming problem
CO3	To Apply transportation and assignment models to find optimal solution in warehousing and travelling
CO4	To Acquire the basic concepts of network optimization problems
CO5	Develop an understanding and appreciation of game theory and dynamic programming as effective tools in addressing real world problems

COURSE CODE :20BA2206 COURSE NAME: BUSINESS RESEARCH METHODS	
CO1	Remember the basic method for research.
CO2	Understand the various tools and types of research
CO3	Apply and gain knowledge of measurement in research.
CO4	Understanding the data descriptions and analysis through quantitative and Qualitative ways.
CO5	Remember the models of presenting the different reports.

COURSE CODE :20BA2001 COURSE NAME:BUSINESS APPLICATION LAB - II	
CO1	Understand the basics of an excel and an overview about importing data and using hyperlink
CO2	Apply data validation and an overview about formula menu
CO3	Understand and apply to work with consolidating and analyzing the data
CO4	Understand goal seek, scenario manager, and solver
CO5	Understand to work with pivot tables, macros and protecting workbooks

COURSE CODE :20BA2002 COURSE NAME:MANAGERIAL SKILL DEVELOPMENT LAB-II	
CO1	Apply written communication skills and prepare business reports
CO2	Understand basic features of Ms and its Applications in Managerial Decision Making
CO3	Understand basic features of G-Suite and its Applications in Managerial Decision Making
CO4	Understand the ways to effectively communicate in social media
CO5	Understand the ways to effectively handle comments in social media

COURSE CODE : 20BA2701 COURSE NAME:RURAL INNOVATION PROJECT	
CO1	Understand the present trend of rural market
CO2	Understand the problems of rural market
CO3	Create awareness on the study of rural market
CO4	Empower the players in rural market
CO5	Provide innovative techniques to strengthen the rural market

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COURSE OUTCOMES (COs)

SEMESTER III

COURSE CODE : 20BA3201 COURSE NAME: STRATEGIC MANAGEMENT	
CO1	To create knowledge and understanding of the strategic management concepts.
CO2	To understand the nuances of competitive advantage
CO3	To understand different levels of strategy for success
CO4	To create business models and innovative products for success.
CO5	To present the report for the issues in organizational strategy

COURSE CODE : 20BA3302 COURSE NAME: INTERNATIONAL BUSINESS	
CO1	Students would be familiar with global business environment

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CO2	Global practices in trade
CO3	Get acquainted with the global strategic management Practices and functional domain practice
CO4	The role of foreign exchange in international trade
CO5	They would be familiar with conflict situations and ethical issues in global business

COURSE CODE :20BA3001 COURSE NAME : DATA ANALYSIS AND BUSINESS MODELING	
CO1	Understand and create questionnaire for data collection and data file in SPSS for analysis
CO2	Apply and check the data distribution and also perform descriptive statistics & relationship
CO3	Apply t test to statistically test the mean differences
CO4	Understand appropriate test to statistically test mean differences for more groups / variables and estimate relationships
CO5	Understand non-parametric test in SPSS and its application

COURSE CODE :20BA3702 COURSE NAME: MANAGERIAL SKILL DEVELOPMENT LAB-III	
CO1	Visualize the art of Attending and giving interviews.
CO2	Acquire the skills needed for a group discussion.
CO3	Familiarize with various types of managerial skills
CO4	Comprehend themselves to develop various dimensions of communication skills
CO5	Develop collaborative capacity, perspective coordination, contextual thinking, and decision-making process.

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COURSE OUTCOMES (COs)

SEMESTER IV

COURSE CODE : 20BA4201 COURSE NAME:INDIAN ETHOS AND VALUES	
CO1	To impart knowledge on Indian Ethos

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CO2	To apply Indian value system in management practices
CO3	To familiarize the students about Indian philosophy for business growth
CO4	Students will know about management functions and its Indian perspectives.
CO5	To conceptualize and present various issues in Indian management thought.

HICET	**COURSE OUTCOMES (COs)**

Professional Electives

COURSE CODE : 20BAX301 **COURSE NAME:INTEGRATED MARKETING COMMUNICATION**	
CO1	Acquire the basic knowledge in integrated marketing communication
CO2	Understand and analyze the various elements of communication process and their application as a promotion tool.
CO3	Visualize the process of creating an advertisement and its strategies
CO4	Correlate the importance of promotion tools in communicating to customers
CO5	Visualize the impact of information technology and the latest trends in using it for communication process.

COURSE CODE : 20BAX302 **COURSE NAME:CUSTOMER RELATIONSHIP MANAGEMENT**	
CO1	Understand the fundamentals of customer relationship management
CO2	Visualize the behaviour of the customer and plan the CRM activities
CO3	Develop a CRM process and implement the same
CO4	Visualize the impact of information technology in CRM process
CO5	Understand e-CRM and its application in creating a e-business strategy.

COURSE CODE : 20BAX303 **COURSE NAME:BRAND MANAGEMENT**	
CO1	Understand the key principles and elements of branding.
CO2	Practically develop a brand, including positioning and communications

CO3	Develop the process and methods of brand management, including how to establish brand image and identity.
CO4	Analyze the effective branding strategies, brand extension programs and new product development.
CO5	Formulate and justify brand valuation and develop building brands.

COURSE CODE : 20BAX304 COURSE NAME:RETAIL MANAGEMENT	
CO1	Conceptualize the fundamentals of retail management.
CO2	Visualize the consumer shopping behaviour and retail market segments in India.
CO3	Differentiate the retail formats and analyze the role of MNC's in organized retailing.
CO4	Develop retail location and plan the retails operation.
CO5	Familiarize in retail formats

COURSE CODE : 20BAX305 COURSE NAME:SERVICES MARKETING	
CO1	Visualize the characteristics of service products and tangible goods.
CO2	Design service quality measurements to build customer loyalty and evaluate the effectiveness and efficiency of customer service offerings.
CO3	Comprehend the unique challenges of services marketing, including the elements of product, price, place, promotion, processes, physical evidence, and people.
CO4	Apply the 7 P's of the services marketing mix to develop a positioning strategy for any service organization.
CO5	Familiarize the strategies of various service sectors

COURSE CODE : 20BAX306 COURSE NAME:CONSUMER BEHAVIOUR	
CO1	Demonstrate how knowledge of consumer behaviour can be applied to marketing
CO2	Visualize the Consumer behaviour decision process and factors affecting – External factors / Internal factors
CO3	Relate internal dynamics such as personality, perception, learning motivation and attitude to the choices consumers make in buying.
CO4	Use appropriate Models of consumer buying behavior
CO5	Be able to demonstrate how consumerism and digital Marketing improves sales.

COURSE CODE : 20BAX307 COURSE NAME: INTERNATIONAL MARKETING	
CO1	Develop an understanding of nuances related to international marketing.
CO2	Have developed skills in researching and analyzing trends in global markets and in modern marketing practice
CO3	Be able to assess an organization's ability to enter and compete in international markets
CO4	Identify potential business opportunities in international markets and formulate suitable strategies.
CO5	Prepare a comprehensive international marketing plan

COURSE CODE : 20BAX308 COURSE NAME:EQUITY RESEARCH AND PORTFOLIO MANAGEMENT	
CO1	To understand the various alternatives available for investment.
CO2	To Analyze the risk and return in stock investment.
CO3	To comprehend the fundamental and technical analysis
CO4	To Analyze the value of bonds and stock returns
CO5	To Evaluate a portfolio of stocks and performance analysis

COURSE CODE : 20BAX309 COURSE NAME:FINANCIAL AND INSURANCE SERVICES	
CO1	Analyze the role of Merchant Bankers, SEBI, NBFC and Mutual funds and other financial markets in India
CO2	Visualize the various fund based financial services
CO3	Visualize the various fee based financial services
CO4	Have the basic knowledge about the Indian Insurance Industry
CO5	Evaluate and Invest in Life Insurance Health Insurance General Insurance

COURSE CODE : 20BAX310 COURSE NAME:BANKING REGULATIONS AND SERVICES	
CO1	Analyze Structural framework-Indian Banking System.
CO2	Evaluate the Banking services provided by the banks.
CO3	Learn the Regulatory framework related to Banking Regulations
CO4	Apply the Marketing of banking services
CO5	Apply of Technology in Banking

COURSE CODE :20BAX311 COURSE NAME:INTERNATIONAL FINANCIAL MANAGEMENT	
CO1	Analyze International Financial Management Environment
CO2	Evaluate the Currency forecasting and Manage foreign exchange risk

CO3	Analysis of Foreign Investment Decision.
CO4	Learn Multinational Cash management.
CO5	Perform Foreign Exchange Operations.

COURSE CODE :20BAX312 COURSE NAME:FINANCIAL DERIVATIVES	
CO1	Understand the regulatory frame work of derivative markets
CO2	Understand the methods of derivative contracts
CO3	Understand the hedging strategy in international trade
CO4	Understand the Option's mechanism in financial transactions
CO5	Understand the growth of Commodity market in India.

COURSE CODE :20BAX313 COURSE NAME:BEHAVIOURAL FINANCE	
CO1	To identify the limitations of „rational" models of investment decision making
CO2	To understand the cognitive biases and errors of judgment that affect financial decisions
CO3	Evaluate the main results in the field of behavioral finance on financial market processes including market anomalies
CO4	To Synthesize theories of behavioral finance theories with the rational decision making models
CO5	Explore behavioral corporate finance, considering financial, investment and dividend policy decisions and contrasting traditional and behavioral approaches.

COURSE CODE :20BAX314 COURSE NAME:PERSONNEL AND INTERPERSONAL EFFECTIVENESS	
CO1	Understand various dimensions of self and its importance with exercises.
CO2	Make students conversed with interpersonal relationships and can analyze the cultural differences in interpersonal communication
CO3	Understand the importance of assertiveness and apply it in organizational life
CO4	Analyze various transactions in day to day life and apply in organizational decision-making process
CO5	Acquire the skills of counselling.

COURSE CODE :20BAX315 COURSE NAME:TALENT MANAGEMENT	
CO1	Visualize the role of the HR professional as a talent management function.
CO2	Explore the various approaches to implement best practices of talent management within an organization.
CO3	Confidently design and plan the talent management system to acquire people.

CO4	Have the skills in the process of engaging, retaining and compensating in talent management.
CO5	Understand and apply HR analytics to enhance business value

COURSE CODE :20BAX316 COURSE NAME:INDUSTRIAL RELATIONS AND LABOUR LEGISLATIONS	
CO1	Understand the industrial relation systems in India and as well as at International level
CO2	Have adequate knowledge of acts relating to trade union and dispute management and apply it in corporate life
CO3	Utilize provisions regarding social welfare measures in their workplace.
CO4	Employ the law regarding the wages when faced with issues relating to it
CO5	Get acquainted with factories act and other laws pertaining to women and children

COURSE CODE :20BAX317 COURSE NAME:ORGANIZATIONAL DEVELOPMENT	
CO1	Visualize the philosophical, historical, theoretical, political and practical underpinnings of OD as a core area of practice within HRD.
CO2	Gain an insight into the organizational development programmes and the components of OD.
CO3	Increase awareness of different tools that are used to diagnose organizations as well as interventions used through hands-on experience.
CO4	Comprehend how to evaluate organizational development interventions and the use of technology.
CO5	Enhance their skills in the latest trends in OD.

COURSE CODE : 20BAX318 COURSE NAME:INTERNATIONAL HUMAN RESOURCE MANAGEMENT	
CO1	Visualize the concept of International HRM
CO2	Analyze the strategic issues in International business
CO3	Help students to focus on staffing strategies in international context
CO4	Acquire skills in managing compensation practices at the global level
CO5	Gain Knowledge on the current trends of IHRM

COURSE CODE :20BAX319 COURSE NAME :STRATEGIC HUMAN RESOURCE MANAGEMENT	
CO1	Understand perspective of strategic human resource management
CO2	Remember and understand processes of strategic human resource management

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CO3	Understand and apply strategic human resource formulations in corporate world
CO4	Understand the organizational and corporate context of SHRM
CO5	Understand about the future strategic HR

COURSE CODE :20BAX320 COURSE NAME: MANPOWER PLANNING, RECRUITMENT AND SELECTION	
CO1	Understand perspective of strategic human resource management
CO2	Remember and understand processes of strategic human resource management
CO3	Understand and apply strategic human resource formulations in corporate world
CO4	Understand the organizational and corporate context of SHRM
CO5	Understand about the future strategic HR

COURSE CODE :20BAX321 COURSE NAME: TEAM DYNAMICS AT WORK	
CO1	Comprehend the basics of team concept
CO2	Analyze the implications of group dynamics
CO3	Create strategies to build effective team
CO4	Acquire skills for team management
CO5	Comprehend the contemporary issues in team building

COURSE CODE :20BAX322 COURSE NAME: DATA VISUALIZATION FOR MANAGERS	
CO1	Understand data visualization basics and process.
CO2	Understand and select the right tool for data visualization and graphics
CO3	Able to handle various data formats, prepare data for analysis and understand design standards.
CO4	Able to optimize data story and presentation
CO5	Apply data visualization tools namely tableau and power BI.

COURSE CODE :20BAX323 COURSE NAME: BUSINESS INTELLIGENCE	
CO1	Understand the basics of business intelligence and business analytics.
CO2	Apply the concepts of data warehousing, business reporting, visualization and performance management
CO3	Understand the process of data mining, text mining, web mining and social media analytics.
CO4	Understand decision support system modeling, simulation and automated decision systems.

CO5	Gain insight on big data analytics and emerging trends in business analytics.

COURSE CODE :20BAX324 **COURSE NAME: BIG DATA ANALYTICS**	
CO1	To understand the basic of big data in business decisions
CO2	To visualize fundamentals of big data analytics
CO3	To comprehend the application of techniques in big data analytics
CO4	To visualize the various visualization techniques
CO5	To apply different techniques in data mining.

COURSE CODE :20BAX325 **COURSE NAME: HUMAN RESOURCE AND FINANCIAL ANALYTICS**	
CO1	Understanding on human resource analytics, its role and importance.
CO2	Understanding on HR processes and perform diversity analysis.
CO3	Evaluate effectiveness of recruitment, selection and performance using HR analytics.
CO4	Understanding on financial analytics and forecasting.
CO5	Understanding on financial modeling and building a financial model.

COURSE CODE :20BAX326 **COURSE NAME: MARKETING ANALYTICS**	
CO1	Understanding on marketing analytics and sources of data for analytics.
CO2	Analyze pricing strategies and to optimize price.
CO3	Measure effectiveness of advertising and media selection.
CO4	Carry out market segmentation and sales forecasting analysis.
CO5	Measure customer value and perform retail analytics.

COURSE CODE :20BAX327 **COURSE NAME: INNOVATION AND TECHNOLOGY MANAGEMENT**	
CO1	Update knowledge on technological changes and innovative business solutions for firm's sustainable development.
CO2	Analyze the technology management challenges and provide solutions to manage technology in turbulent environment.
CO3	Apply critical thinking and employ problem solving approach to mitigate the hindrances in innovation and technology management.
CO4	Evaluate the role of innovation in organizational process and ensure innovation works as a core competency in technology management
CO5	Display the breadth of skills changing the landscape of organizational success with highly recognized innovative practices to

	manage technology adoption.

COURSE CODE : 20BAX328 COURSE NAME: LEAN AND AGILE MANUFACTURING SYSTEMS	
CO1	Understand the key requirements and concepts of lean manufacturing
CO2	Apply the tools in lean manufacturing to analyses a manufacturing system and plan for its improvements.
CO3	Appreciate the significance of lean culture to initiate a continuous improvement change program in a manufacturing organization.
CO4	Gain global knowledge on agile systems and determine the methodologies of introducing agile and scrum system in an organization.
CO5	Critically evaluate and implement agile processes and scrums for designated projects and review in an organization with an eye for improvement.

COURSE CODE :20BAX329 COURSE NAME: TOTAL QUALITY MANAGEMENT	
CO1	Understand the key requirements and concepts of lean manufacturing
CO2	Apply the tools in lean manufacturing to analyses a manufacturing system and plan for its improvements.
CO3	Appreciate the significance of lean culture to initiate a continuous improvement change program in a manufacturing organization.
CO4	Gain global knowledge on agile systems and determine the methodologies of introducing agile and scrum system in an organization.
CO5	Critically evaluate and implement agile processes and scrums for designated projects and review in an organization with an eye for improvement.

COURSE CODE :20BAX330 COURSE NAME: LOGISTICS AND SUPPLY CHAIN MANAGEMENT	
CO1	Visualize the structure of supply chains and its importance in the competitive market.
CO2	Will be able to design an effective supply chain network
CO3	Comprehend the components of the Logistics system
CO4	Analyze the role of various intermediaries in the logistics system
CO5	An understanding on the importance of the global logistics system in today's context.

COURSE CODE :20BAX331 COURSE NAME: OPERATIONS STRATEGY	
CO1	Visualize the concept of strategy formulation and the importance of operations strategy in business.

CO2	Make students infer the importance of resource audit and competitiveness in strategy formulation for operations in business.
CO3	Have an appreciable knowledge on love competency in planning the operation strategy.
CO4	Have an appreciable knowledge on the development of operation strategy for different types of organization
CO5	Make student infer the different methods of evaluating the strategy for operational excellence.

COURSE CODE :20BAX332 **COURSE NAME: SALES AND OPERATIONS PLANNING**	
CO1	Visualize the importance of integration sales and operations management.
CO2	To have appreciable knowledge in different methods and techniques to balance the demand and supply.
CO3	To apply various techniques in scheduling the production operations for increasing the efficiency of the organization.
CO4	Comprehend the importance of the integrated outsourced model to manage the sales for increasing the efficiency of the organization.
CO5	To have appreciable knowledge on the sales and operational planning across different industries

COURSE CODE :20BAX333 **COURSE NAME: SOURCING MANAGEMENT**	
CO1	To visualize the need and importance of sourcing.
CO2	To have an appreciable knowledge in the process of vendor management in sourcing.
CO3	To visualize the key concepts of inventory management and the application of various models of inventory during sourcing.
CO4	To visualize the process of sourcing for different industries.
CO5	To visualize the process of sourcing for different types of institution.

COURSE CODE :20BAX334 **COURSE NAME: QUALITY TOOL KIT FOR MANAGERS**	
CO1	To visualize the need and importance of sourcing.
CO2	To have an appreciable knowledge in the process of vendor management in sourcing.
CO3	To visualize the key concepts of inventory management and the application of various models of inventory during sourcing..
CO4	To visualize the process of sourcing for different industries.
CO5	To visualize the process of sourcing for different types of institution.

COURSE CODE :20BAX335 **COURSE NAME: LOGISTICS MANAGEMENT**

CO1	Be able to understand the concept of logistics and the organization needed for the supply chain process.
CO2	Be able to plan the inventory, storage systems and the material handling systems for the supply chain.
CO3	Be familiar with the various containers for moving goods and the importance of intermediaries in the logistics system
CO4	Be familiar with the various transportation modes and planning the appropriate mode of transportation for the logistics system.
CO5	Be able to understand the impact of technology on the logistics system and the global logistics system.

COURSE CODE :20BAX336 COURSE NAME: EXPORT IMPORT TRADE AND DOCUMENTATION	
CO1	Understand the basic concepts of exports and imports in international trade.
CO2	Understand the various steps in export process.
CO3	Get familiarized with the procedure of importing goods and services.
CO4	Acquainted with the process of documentation in international business.
CO5	Understand the EXIM policy framework in local, regional and global context and apply its provisions.

COURSE CODE :20BAX337 COURSE NAME: SUPPLY CHAIN MANAGEMENT	
CO1	Understand the concept of SCM and its strategic importance.
CO2	Understand the various processes in SCM for improving distribution network in orgnizational performance.
CO3	Design a production planning process in achieving competitive advantage.
CO4	To have practical insight in to the various aspects of inventory in logistics function.
CO5	To understand the application of IT in SCM process.

COURSE CODE :20BAX338 COURSE NAME: INTERNATIONAL LOGISTICS & SHIPPING MANAGEMENT	
CO1	Visualize the elements of the international logistics system
CO2	Comprehend the various commercial documents used in export and import business.
CO3	Recognize the basic elements in ocean transportation.
CO4	Learn the current issues for the design and evaluation of an international logistics system.
CO5	Comprehend the Indian Shipping System.

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COURSE CODE :20BAX339 COURSE NAME: SUPPLY CHAIN ANALYTICS	
CO1	Visualize the huge opportunity that exists in supply chain analytics.
CO2	Visualize various analytic techniques for supply chain decisions.
CO3	Comprehend the application of analytics in souring and procurement for increasing the efficiency of the supply chain.
CO4	To use the analytics part in an effective manner to increase the customer satisfaction and reduce distribution Cost.
CO5	Appreciable knowledge on developing supply chain strategies for effective reverse logistics to increase the customer satisfaction.

COURSE CODE :20BAX340 COURSE NAME: DESIGN AND CHANGE IN ORGANIZATION	
CO1	Visualize the concept of organizational design.
CO2	To learn Organization design structures and its effectiveness.
CO3	To comprehend the impact of organization change.
CO4	Students will be able to learn the steps in implementing change
CO5	Realize the process of managing change in organisation.

COURSE CODE :20BAX341 COURSE NAME: PLANNING, STRUCTURING AND FINANCING SMALL BUSINESS	
CO1	To enable the students understand the importance of small scale business in a developing economy like India.
CO2	To visualize the dynamics of Small scale business.
CO3	Comprehend the supporting factors of small business.
CO4	Appreciable knowledge on the techniques in managing small business.
CO5	Visualize the new trends in small business

COURSE CODE : 20BAX342 COURSE NAME: BUSINESS PLAN PREPARATION FOR SMALL BUSINESS	
CO1	Visualizing various business entry strategies and examine the effects on their busi2ess concepts.
CO2	Identify and understand a clear marketing plan for business
CO3	Comprehend the real implications of financial resources
CO4	Identify markets, analyze potential competition, and build customer profiles
CO5	Inheriting the skills needed for presenting a business.

COURSE CODE :20BAX343 COURSE NAME:MARKETING FOR SMALL BUSINESS	
CO1	To visualize the basic marketing principles for a small business
CO2	Comprehend the networking and marketing strategies for the success of small business

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CO3	Acquire the skills for promoting the products of small business
CO4	Understand the importance of social media marketing for small business success.
CO5	To Identifying the benefits of E-CRM in developing the small business to national level.

COURSE CODE :20BAX344 COURSE NAME:FINANCE AND ACCOUNTING FOR SMALL BUSINESS	
CO1	To enable the students to understand the finance and accounting concepts of small Business
CO2	To understand the concepts and techniques of Capital Budgeting, Working Capital Man3agement of small business
CO3	To throw light on the significance of costofCapital for deciding the Capital Structure of small business
CO4	Comprehend the technique of making decisions related to taxation of small business
CO5	Visualize the concept of GST its impact on small business.

COURSE CODE :20BAX345 COURSE NAME:MASS COMMUNICATION	
CO1	Have the basic knowledge in Mass Communication and its influence.
CO2	Understand the basics of print Media and its evolution.
CO3	Understand the basics of broadcast Media, its evolution and the process of developing.
CO4	Visualize the impact of IT and the developments in Digital Marketing sphere.
CO5	To prepare socially responsible media academicians, researchers and professionals.

COURSE CODE :20BAX346 COURSE NAME:JOURNALISM	
CO1	Visualize the nature and functions of Journalism and the different kinds of journalism evolved.
CO2	Analyze the role of press in India.
CO3	Understand the different types of magazine journals and its importance.
CO4	Understand the medium of photo journalism and its importance.
CO5	Understand the basics of digital journalism and latest trends in journalism.

COURSE CODE :20BAX347- COURSE NAME :MEDIA MANAGEMENT AND PUBLIC RELATIONS	
CO1	Understand the basics of Media Planning and its Metrics.
CO2	Visualize the components of Media Mix and its planning.
CO3	Plan and implement a Media Plan.
CO4	Understand the concept of PR and its importance to Media.

CO5	Evaluate the Media Management, PR strategy and planning through the objectives.

COURSE CODE :20BAX348 **COURSE NAME :MEDIA LAW AND ETHICS**	
CO1	Examine media law and ethics pertaining to media.
CO2	Understand the media acts and principles to the professional settings.
CO3	Analyse various laws relating to Patent Rights
CO4	Comprehend various Media Law relating to women and broadcast media.
CO5	Differentiate Ethics Vs Law and understand the various regulatory bodies in India.

COURSE CODE :20BAX349 **COURSE NAME :MEDIA PRODUCTION PLANNING AND MANAGEMENT**	
CO1	Visualize the nature and functions of Media Planning & Management
CO2	Understand the concepts of Reach & Frequency
CO3	Understand the concepts of Media Pricing
CO4	Comprehend Advertising research
CO5	Examine the budget allocation for a media plan and fundamentals

COURSE CODE :20BAX350 **COURSE NAME :ELECTRONIC COMMERCE**	
CO1	Understand the basic concepts and technologies used in the field of e-commerce.
CO2	Have the knowledge of Cloud Computing in e-commerce
CO3	Understand the processes of development of Electronic payment system.
CO4	Understand the ethical, social, and security issues of information systems.
CO5	Gain all knowledge about Web page creation and Mobile e-commerce.

COURSE CODE :20BAX351 **COURSE NAME :SYSTEM ANALYSIS AND DESIGN**	
CO1	Visualize the terminology of systems analysis and design.
CO2	Comprehend the problem-solving methods in systems development.
CO3	Demonstrate and develop methodologies, standards, and System Development Life Cycle.
CO4	Be aware of the systems analysis project with E-R Models and develop a project.
CO5	Comprehend the process of system implementation.

COURSE CODE :20BAX352 **COURSE NAME :ENTERPRISE RESOURCE PLANNING**	
CO1	Understand ERP its role in integrating business functions
CO2	Comprehend the strategic options for ERP identification and adoption.
CO3	Design the ERP implementation strategies.

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CO4	Create reengineered business processes for successful ERP implementation.
CO5	Gain all knowledge about ERP Software and its new trends.

COURSE CODE :20BAX353 COURSE NAME :BUSINESS ANALYTICS	
CO1	Visualize the basic concepts of business intelligence.
CO2	Have the knowledge of the business analytical strategy.
CO3	Understand the technologies with emphasis on data mining.
CO4	Have practical insight in to the various aspects of tools and services to the development of data warehousing.
CO5	Gain all knowledge about various Business Intelligence Architectures and its new trends.

COURSE CODE :20BAX354 COURSE NAME :SOFTWARE PROJECT MANAGEMENT	
CO1	Visualize the basic concepts of project management
CO2	Have the knowledge of the project activities.
CO3	Understand the technologies with emphasis on Resource allocation.
CO4	Have practical insight in to the various aspects of Configuration Management.
CO5	Gain all knowledge about various software maintenance and its new trends.

COURSE CODE :20BAX355 COURSE NAME :TOURISM MANAGEMENT	
CO1	Visualize the concept tourism - both domestic and international.
CO2	Plan and organize tourism to various destination
CO3	Have the knowledge on various tourism organization both national and international
CO4	Understand the different tourism products
CO5	Gain knowledge and appreciate the heritage of Tamilnadu

COURSE CODE :20BAX356 COURSE NAME :TOURISM MARKETING	
CO1	Visualize the tourism marketing concepts and its evolution in current scenario
CO2	Describe and explain tourist behavior through their new knowledge of leisure psychology
CO3	Become familiar with the marketing mix and be able to formulate the best mix for a particular travel product
CO4	Understand and conceptualize the skills needed for the Tourism industry.
CO5	Enable the students to get along with the current trends in tourism marketing both local and international

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COURSE CODE :20BAX357 COURSE NAME :EVENT MANAGEMENT	
CO1	Visualize the concept and typology of events
CO2	Understand the techniques and strategies required to plan successful events
CO3	Acquire skills regarding preparation of budget, apply and evaluate the proposal.
CO4	Select location and design an event
CO5	Plan and execute the logistics for an event.

COURSE CODE :20BAX358 COURSE NAME :TRAVEL AGENCY AND TOUR OPERATION	
CO1	Visualize the growth and prospects of travel agency and tour operator trade.
CO2	Know the rules and regulations of the government to set up travel agency and tour operation business.
CO3	Be confident in planning the tour itinerary.
CO4	Application of domain knowledge in tour packaging and pricing of it.
CO5	Knowledge about the various trade associations involved in the tourism industry and their support in the development of the travel and tour operations across the globe.

COURSE CODE :20BAX359 COURSE NAME :HOSPITALITY MANAGEMENT	
CO1	Visualize the basics of Hospitality industry.
CO2	Enhanced skills and industry exposure to the operations in front office of the hospitality industry.
CO3	Comprehend the functions of house keeping
CO4	Visualize the students with the nuances of the food and beverage department.
CO5	Understand the different methods of evaluating the performance of the hotel.

COURSE CODE :20BAX360 COURSE NAME :HOSPITAL OPERATIONS MANAGEMENT	
CO1	Visualize the basic operations in the Hospital.
CO2	Comprehend the various laboratory services in Hospital.
CO3	Understand the concept of Quality in Hospital and the process of getting certification.
CO4	To have practical insight into the various supporting services of hospitals.
CO5	To understand the various facility management requirements in hospitals.

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COURSE CODE :20BAX361 COURSE NAME :HOSPITAL ARCHITECTURE PLANNING, DESIGN & MAINTENANCE	
CO1	Design and Plan a hospital infrastructure.
CO2	Understand the various processes in Project Management and formulation of projects.
CO3	Use various tools and techniques to prepare a project report.
CO4	To have practical insight in to the process of organizing a project.
CO5	To plan and execute a project effectively.

COURSE CODE :20BAX362 COURSE NAME :INTERNATIONAL HEALTH MANAGEMENT	
CO1	Visualize the International health care scenario.
CO2	Comprehend the reforms in the health care sector with an international perspective.
CO3	Understand a health care delivery system.
CO4	Appreciate the importance of IPR and its relevance to the health care sector.
CO5	Comprehend the International health care policies for the betterment of health care.

COURSE CODE :20BAX363 COURSE NAME :PUBLIC HEALTH SYSTEMS AND HEALTH INSURANCE	
CO1	Visualize the process of the Public health system.
CO2	Comprehend the reforms in the Health sector and its financial implications.
CO3	Comprehend the process of planning and budgeting of the health care programmes.
CO4	Have practical insight into risk management and insurance in general.
CO5	Understand the actuarial principles in Health Insurance system and the risk coverage.

COURSE CODE :20BAX364 COURSE NAME :HEALTHCARE LAWS AND ETHICS	
CO1	Comprehend the ethical issues in health care
CO2	Visualize the laws and regulations with regard to the use and disclosure of health information
CO3	Comprehend the organizational and procedural laws in health care industry
CO4	To have practical knowledge of medical jurisprudence.
CO5	Comprehend the various legal frame work for hospitals and the laws relating to consumer protection act.

COURSE CODE :20BAX365 COURSE NAME :HOSPITAL FRONT OFFICE MANAGEMENT

CO1	Visualize the fundamentals of front office management in hospital environment.
CO2	Understand and be aware of basic outpatient services and inpatient services patient satisfaction.
CO3	Visualize the handling of communication with traumatized patient and their at tenders.
CO4	Comprehend the Importance of Documentation, Automation and IT in the Front Office.
CO5	Visualize the basics of reception duties and handling minor equipment's.

COURSE CODE :20BAX366 COURSE NAME :ENTREPRENEURSHIP DEVELOPMENT	
CO1	Visualize the different aspects of Entrepreneurship, and its role in Business and society.
CO2	Comprehend the Qualities and evolution of Entrepreneur.
CO3	Visualize the skills needed for an entrepreneur.
CO4	Identify, evaluate the Institutional Support for Entrepreneurship development
CO5	Comprehend the government schemes available for the entrepreneurs

COURSE CODE :20BAX367 COURSE NAME :INNOVATION MANAGEMENT	
CO1	Visualize the different aspects of innovation, and its role in business and society.
CO2	Apply innovation-related theories in different settings in order to generate new approaches to innovation.
CO3	Design and develop strategies for new product development.
CO4	Identify, evaluate and suggests solutions to challenges in large and small organizations relating to innovative performance
CO5	Make students apply the learning in real world situations.

COURSE CODE :20BAX368 COURSE NAME :SOCIAL ENTREPRENEURSHIP	
CO1	Differentiate social entrepreneurship from business Entrepreneurship and identify areas of our economy /society where social entrepreneurs work.
CO2	Visualize how social entrepreneurship can contribute to whole systems.
CO3	Comprehend the financial issues for an entrepreneur in general and social entrepreneur in particular.
CO4	Analyze the social marketing environment.
CO5	Comprehend the nature of corporate social responsibility in creating social value in developing business in India and abroad.

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COURSE CODE :20BAX369 COURSE NAME :SMALL BUSINESS MANAGEMENT	
CO1	Visualize the importance and role of small business.
CO2	Comprehend the Dynamics of Small Business
CO3	Understand the institutional support to the development of small business and be prepared for interacting with them
CO4	Face the challenges of the small business.
CO5	Identifying the Global Opportunities for Small Business

COURSE CODE :20BAX370 COURSE NAME :SCIENCE AND TECHNOLOGY ENTREPRENEURSHIP	
CO1	Visualize the importance and role of science and Technology Entrepreneurship.
CO2	Comprehend the role of entrepreneurship in Science and Technology.
CO3	Visualize the stages in the evolution of technology management.
CO4	Appreciate the relationship between Technology Economic developments.
CO5	Identifying the Future Opportunities for science and Technology Entrepreneurship

COURSE CODE :20BAX371 COURSE NAME :FERTILIZER TECHNOLOGY AND MANAGEMENT	
CO1	Visualize the different manure and fertilizers used in different crops according to soil condition
CO2	Comprehend the basic principles and methods in fertilizer production.
CO3	Acquire knowledge in fertilizer management.
CO4	Students become aware on the phases in fertilizer testing and marketing.
CO5	Comprehend the essentiality of fertilizer use in environment.

COURSE CODE :20BAX372 COURSE NAME :MANAGEMENT OF AGRO CHEMICAL INDUSTRY	
CO1	Gain appreciable knowledge about the agro-chemical industries.
CO2	Appreciable knowledge in the use of Insecticides in agriculture.
CO3	Appreciable knowledge in the use of fungicides in agriculture.
CO4	To infer the process in development of agro-chemicals.
CO5	To have an appreciable knowledge in the organizational set up for plant protection.

COURSE CODE :20BAX373 COURSE NAME :MANAGEMENT OF FLORICULTURE AND LANDSCAPING	
CO1	Gain appreciable knowledge on floriculture industry.
CO2	To develop effective ideas related to gardening.
CO3	Gain appreciable knowledge on Landscape gardening.

CO4	Interpret different styles of gardening.
CO5	Management of Post Harvesting of commercial crops.

COURSE CODE :20BAX374 COURSE NAME :FARM POWER AND MACHINERY MANAGEMENT	
CO1	Understand various sources of farm power and farm mechanization.
CO2	Gain appreciable knowledge on the tractor and power tillage industry.
CO3	Gain appreciable knowledge on the management of farm machinery.
CO4	Gain appreciable knowledge on cost management practices in the farm power and machinery management.
CO5	Gain Practical knowledge on specialized agricultural equipments

COURSE CODE : 20BAX375-FEED BUSINESS MANAGEMENT COURSE NAME :FEED BUSINESS MANAGEMENT	
CO1	Understand about feed industry worldwide.
CO2	Demonstrate a basic understanding of livestock nutrition.
CO3	Comprehend the basic knowledge on processing of feeds
CO4	Visualize the importance of mineral mixture.
CO5	Students will gain knowledge about food stuff in livestock management & its marketing.

COURSE CODE :20BAX376 COURSE NAME :POULTRY AND HATCHERY MANAGEMENT	
CO1	Gain appreciable knowledge on the management of poultry industry.
CO2	Visualize the basics in establishing a poultry and hatchery unit.
CO3	Comprehend the process of incubation and hatching in poultry.
CO4	To infer the basics on franchise hatcheries and management of them.
CO5	Comprehend the HR and marketing skills needed in poultry and hatcheries.

COURSE CODE :20BAX377 COURSE NAME :FOOD TECHNOLOGY AND PROCESSING MANAGEMENT	
CO1	Gain appreciable knowledge on the food industry in India.
CO2	Visualize the basics on food processing and food preservation.
CO3	To analyze the cost and management of quality in a food organisation.
CO4	To appraise the students with the formulation of projects in various food industries.
CO5	Gain appreciable knowledge on the performance parameters for food processing.

COURSE CODE :20BAX378

COURSE NAME :FRUIT PRODUCTION AND POST HARVEST MANAGEMENT	
CO1	Gain appreciable knowledge on the horticulture industries.
CO2	Comprehend on various types of horticulture crops.
CO3	Acquire knowledge on post-harvest management tools & techniques in horticulture industry.
CO4	Able to identify different functional fruits and development of drinks from them.
CO5	Gain knowledge on marketing & quality standards for trade.

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COURSE OUTCOMES (COs)

OPEN ELECTIVES

COURSE CODE:20LSX401 COURSE NAME:ENTREPRENEURSHIP & INNOVATION	
CO1	Understand the nature of business opportunities, resources, and industries in critical and creative aspects.
CO2	Understand the processes by which innovation is fostered, managed, and commercialized.
CO3	Remember effectively and efficiently the potential of new business opportunities.
CO4	Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness..
CO5	Develop a business model for a new venture, including revenue. Margins, operations, working capital, and investment.

COURSE CODE :20LSX402 COURSE NAME :LEADERSHIP AND MANAGEMENT SKILLS	
CO1	To practice essential leadership skills in day to day operations
CO2	To work on leadership skills in the study environment
CO3	To understand and develop the skills consciously.
CO4	To know about the real worth of all the skills for success
CO5	To Analyze the real worth of the person and suggestion for improvement

COURSE CODE :20LSX403 COURSE NAME :INDIAN ETHOS AND HUMAN VALUES	
CO1	To impart knowledge on Indian Ethos for inspirational life
CO2	To apply Business concepts and philosophies for broader perspective in society

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CO3	To familiarize students about Indian philosophy system to handle life efficiently
CO4	To apply values in day to day functioning for better standard of life.
CO5	To conceptualize ethics from western and Indian perspective

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) & PROGRAMME OUTCOMES (POs)

DEPARTMENT NAME	COMPUTER APPLICATIONS
PROGRAMME NAME	MCA
REGULATIONS	R2020 for Batch 2020 - 2022

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO 1	Take up career related to computer applications with required core competencies gained in an assessment driven learning environment.
PEO 2	Prepare graduates for execution of projects that require professionalism in digital industry to code, develop and test software, to perform research for providing software solutions.
PEO 3	Engage in entrepreneurship with given breadth of exposure, experience.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

PO1	**Computational Knowledge** An ability to apply appropriate knowledge of computing fundamentals, mathematics and knowledge of specific domain to model application software.
PO2	**Problem Analysis** An ability to provide solutions to complex computing problems by analyzing, formulating the problem.
PO3	**Design / Development of Solutions** An ability to design, implement and evaluate sustainable computation solutions in the form of processes and components as per specifications.
PO4	**Conduct Investigations of Complex Computing problems** An ability to provide valid conclusions using research based methods and to perform computing practices using state of art technologies. tools and techniques.
PO5	**Modern Tool Usage** An ability to use modern software tools and technologies to develop applications for practical problems.
PO6	**Professional Ethics** An ability to apply principles of management to manage projects and to develop soft skills and to practice professional ethics in multiple disciplines.
PO7	**Life-Long Learning** An ability to involve in continual development as computing professional through self-learning.
PO8	**Project Management and Finance** An ability to demonstrate knowledge of computation in management principles and to manage projects in multidisciplinary environments.

PO9	**Communication Efficacy** An ability to interchange information effectively through verbal and written form
PO10	**Societal and Environmental Concern** An ability to assess the impact of computing on health, safety and culture
PO11	**Individual and Team Work** Function effectively as an individual and as a member in team
PO12	**Innovation and Entrepreneurship** An ability to adapt software engineering practices and to succeed as an employee or an entrepreneur.

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COURSE OUTCOMES (COs)

PROGRAM NAME – MASTER OF COMPUTER APPLICATIONS

For 2020 – 2022 batch students, Upon the successful completion of the course, the students will be able to

SEMESTER III

COURSE CODE : 20CA3201 COURSE NAME : BIG DATA ANALYTICS	
CO1	Understand the fundamental concepts of big data and analytics
CO2	Analyzing the tools and practices for working with big data
CO3	Examine the working of Stream computing.
CO4	Ethical utilization of big data analytics and data visualization techniques
CO5	Make use of NoSQL for big data management

COURSE CODE : 20CA3202 COURSE NAME: OPERATING SYSTEMS	
CO1	Describe the various OS functionalities, Process Management concepts and analyze various process Scheduling Algorithms
CO2	Apply and explore the communication between inter processes and thread usage and to analyze the conditions for deadlock to occur and to resolve deadlock
CO3	Implement memory placement strategies and compare various replacement algorithms related to Main memory and Virtual Memory.
CO4	Differentiate the file systems for applying various file allocation and access techniques, I/O and analyze various Disk Scheduling Strategies
CO5	Representing virtualization concepts and implementing shell programming using UNIX System calls.

COURSE CODE : 20CA3203 COURSE NAME: WEB DEVELOPMENT	
CO1	Able to develop stand-alone and production ready spring applications.

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CO2	Able to design and develop interactive, client-side, server-side executable web applications.
CO3	Able to develop a rapid application in many areas on most platforms
CO4	Able to to create reusable UI components in React JS
CO5	Able to handle the data when it changes value or gets submitted and build better web applications more quickly and with less code.

COURSE CODE : 20CA3204 **COURSE NAME: ARTIFICIAL INTELLIGENCE**	
CO1	Interpret fundamental understanding of the history of artificial intelligence (AI) and its foundations.
CO2	Experiment the fundamental concepts and methods of Artificial Intelligence.
CO3	Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
CO4	Interpret and demonstrate the basic principles of AI in solutions that require problem solving, perception, knowledge representation, and learning.
CO5	Evaluate the ability to share in discussions of AI, its current scope and limitations and value ethical coding practices in societal implications.

COURSE CODE : 20CA3001 **COURSE NAME: MINI PROJECT**	
CO1	Develop skill to create practical solutions to identified problem.
CO2	Use software lifecycle model and other artifacts appropriate for problem.
CO3	Identify and master tools required for the project.
CO4	Plan and work systematically towards completion of a project work.
CO5	Develop the ability to explain and defend their work in front of an evaluation panel.

COURSE CODE : 20CA3002 **COURSE NAME: WEB DEVELOPMENT LAB**	
CO1	Able to understand the client and server technologies by using spring concepts
CO2	Ability to know about the spring applications and Restful Web services
CO3	Ability to understand the dependencies by using spring boot applications
CO4	Ability to know about the use of react components
CO5	Ability to know about the uses of json data in ReactJS

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COURSE OUTCOMES (COs)

SEMESTER IV

COURSE CODE : 20CA4901
COURSE NAME : PROJECT WORK

PROFESSIONAL ELECTIVE - II

COURSE CODE : 20CA3301 COURSE NAME : BLOCK CHAIN TECHNOLOGIES	
CO1	Understand the technology components of Blockchain and how it works behind the scenes.
CO2	Understand the Bitcoin and itsl imitations by comparing with other alternative coins.
CO3	Establish deep understanding of the Ethereum model, its consensus model and code execution.
CO4	Understand the architectural components of a Hyper ledger and its development framework
CO5	Aware of the alternative blockchains and emerging trends in blockchain.

COURSE CODE : 20CA3302 COURSE NAME: CLOUD COMPUTING	
CO1	Ability to understand various service delivery models of a cloud computing architecture.
CO2	Ability to elobrate the ways in which the cloud can be programmed and deployed.
CO3	Ability to analyse cloud architecture, cloud anatomy, network connectivity in cloud, cloud management.
CO4	Ability to inference Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) with several other service models
CO5	Ability to conclude major service providers known in the cloud arena and discusses in detail about the services they offer.

COURSE CODE : 20CA3303

COURSE NAME: CRYPTOGRAPHY AND NETWORK SECURITY	
CO1	Understand the fundamentals of networks security, security architecture, threats and vulnerabilities
CO2	Apply the different cryptographic operations of symmetric cryptographic algorithms
CO3	Apply the different cryptographic operations of public key cryptography
CO4	Apply the various Authentication schemes to simulate different applications
CO5	Understand various Security practices and System security standards.

COURSE CODE : 20CA3304 COURSE NAME: DEEP LEARNING	
CO1	Understand the role of deep learning in machine learning applications.
CO2	Get familiar with the use of TensorFlow and Keras in deep learning applications
CO3	Design and implement deep learning applications.
CO4	Critically analyze different deep learning models in image related projects.
CO5	Design and implement convolutional neural networks and know about applications of deep learning in NLP and image processing.

COURSE CODE : 20CA3305 COURSE NAME: E-COMMERCE	
CO1	Comprehend the underlying economic mechanisms and driving forces of E-Commerce;
CO2	Understand the critical building blocks of E-Commerce and different types of prevailing business models employed by leading industrial leaders;
CO3	Appraise the opportunities and potential to apply and synthesize a variety of E-Commerce concepts and solutions to create business value for organizations, customers, and business partners;
CO4	Formulate E-Commerce strategies that lever firms" core competencies, facilitate organizational transformation, and foster innovation;
CO5	Undertake planning, organizing, and implementing of E-Commerce initiatives to effectively respond to of dynamic market environments.

COURSE CODE : 20CA3306 COURSE NAME: MIXED REALITY	
CO1	Discuss the basic concepts of Mixed Reality.

CO2	Design and develop the Mixed Reality applications in different domains.
CO3	Design various models using modelling techniques.
CO4	Perform Mixed Reality Programming with tool kits.
CO5	Evaluate mixed reality-based applications.

COURSE CODE : 20CA3307 COURSE NAME: ORGANIZATIONAL BEHAVIOR	
CO1	Understand the importance of organizational behavior and organization structure.
CO2	Understand aspects like personality, learning, emotions, attitudes, perceptions, motivation etc which affects individual"s behavior in an organization.
CO3	Remember and Understand how to handle group behavior effectively.
CO4	Remember and Understand various leadership styles and the influence of Power and Politics in organization.
CO5	Understand organizational culture and the dynamics of organizational behavior.

COURSE CODE : 20CA3308 COURSE NAME: RESEARCH METHODOLOGY	
CO1	Ability to formulate research problem
CO2	Ability to carry out research analysis
CO3	Ability to follow research ethics
CO4	Ability to understand that today"s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity
CO5	Ability to understand about IPR and filing patents in R & D.

COURSE CODE : 20CA3309 COURSE NAME: SEMANTIC WEB SERVICES	
CO1	Create ontology for a given domain.
CO2	Develop an application using ontology languages and tools.
CO3	Understand the concepts of semantic web.
CO4	Use ontology related tools and technologies for application creation.
CO5	Design and develop applications using semantic web.

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HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	**COURSE OUTCOMES (COs)**

PROGRAM NAME – MASTER OF COMPUTER APPLICATIONS

For 2021 – 2023 batch students. Upon the successful completion of the course, the students will be able to

DEPARTMENT NAME	Computer Applications
PROGRAMME NAME	MCA
REGULATIONS	R2020 for Batch 2021- 2023

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After the completion of the Programme, the Graduates will

PEO 1	take up career related to computer applications with required core competencies gained in an assessment driven learning environment.
PEO 2	prepare graduates for execution of projects that require professionalism in digital industry to code, develop and test software, to perform research for providing software solutions.
PEO 3	Engage in entrepreneurship with given breadth of exposure, experience.

PROGRAMME OUTCOMES (POs)

Upon completion of the Programme, the students will be able to

PO1	**Computational Knowledge** An ability to apply appropriate knowledge of computing fundamentals, mathematics and knowledge of specific domain to model application software.
PO2	**Problem Analysis** An ability to provide solutions to complex computing problems by analyzing, formulating the problem.
PO3	**Design / Development of Solutions** An ability to design, implement and evaluate sustainable computation solutions in the form of processes and components as per specifications.
PO4	**Conduct Investigations of Complex Computing problems** An ability to provide valid conclusions using research based methods and to perform computing practices using state of art technologies. tools and techniques.
PO5	**Modern Tool Usage** An ability to use modern software tools and technologies to develop applications for practical problems.
PO6	**Professional Ethics** An ability to apply principles of management to manage projects and to develop soft skills and to practice professional ethics in multiple disciplines.

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PO7	**Life-Long Learning** An ability to involve in continual development as computing professional through self-learning.
PO8	**Project Management and Finance** An ability to demonstrate knowledge of computation in management principles and to manage projects in multidisciplinary environments.
PO9	**Communication Efficacy** An ability to interchange information effectively through verbal and written form
PO10	**Societal and Environmental Concern** An ability to assess the impact of computing on health, safety and culture
PO11	**Individual and Team Work** Function effectively as an individual and as a member in team
PO12	**Innovation and Entrepreneurship** An ability to adapt software engineering practices and to succeed as an employee or an entrepreneur.

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HICET

COURSE OUTCOMES (COs)

PROGRAM NAME – MASTER OF COMPUTER APPLICATIONS

Upon the successful completion of the course, the students will be able to

SEMESTER I

COURSE CODE : 21MA1101 **COURSE NAME : PROBABILITY AND STATISTICS, OPERATIONS RESEARCH**	
CO1	Understand the concepts of probability and random variables.
CO2	Acquire the basic concepts of Probability and Statistical techniques for solving mathematical problem.
CO3	Describe various linear, integer programming to solve operational problem with constraints.
CO4	Understand and to find optimal solution in warehousing and Travelling by apply transportation and assignment models.
CO5	Obtain a fundamental knowledge of project scheduling using PERT and CPM.

COURSE CODE : 21CA1201 **COURSE NAME : UI DESIGN & DEVELOPMENT**	
CO1	Able to Understand the basics of world wide web.
CO2	Able to Create website using HTML and Cascading Style Sheets.
CO3	Able to design and implement dynamic web page with validation using JavaScript objects and by applying different event handling mechanisms.
CO4	Able to design rich client presentation using AJAX.
CO5	Able to Design and implement simple web page in PHP.

COURSE CODE : 21CA1202 **COURSE NAME : COMPUTER NETWORKS**	
CO1	Able to Understand the terminologies of Networks and Layers in a Network.
CO2	Able to understand the working principles of Data Link Layer, its functions and Network technology applied in LAN.
CO3	Able to understand the functionalities of Network Layer, IP addressing Mechanism and Routing Protocols.
CO4	Able to learn the Transport layer protocols TCP & UDP and Congestion principles.

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CO5	Able to understand the Network Security concepts applied in Presentation layer.

COURSE CODE : 21CA1203 COURSE NAME : JAVA PROGRAMMING	
CO1	Apprehend the syntax, semantics of Java programming language and create applications using classes and objects
CO2	Design and create new applications by applying reusability and Packages concept
CO3	Apply Multithreading concepts to execute parallelism and explore the concept of Exception handling.
CO4	Implement programs using Frames, Event handlers and Applets
CO5	Synthesize rich applications using I/O, Files, JDBC and System/Utility classes

COURSE CODE : 21CA1204 COURSE NAME : DATABASE MANAGEMENT SYSTEMS	
CO1	To remember the database fundamentals, database design and relational model.
CO2	To identify various methods in Relational Algebra and to write various SQL statements.
CO3	To understand Advanced SQL concepts, Functional Dependencies and various normal forms to be used in the database tables.
CO4	To manage transactions in the tables and to control the concurrency of data in the databases
CO5	To be familiar with Specialty and NoSql Database.

COURSE CODE : 21CA1001 COURSE NAME : JAVA PROGRAMMING LAB	
CO1	Able to create object for the class and to input the values during run time
CO2	Able to write programs in inheritance and achieve reusability. Moreover to implement interface, package, applet and graphics.
CO3	Able to develop programs to understand built in exception and custom exception.
CO4	Able to build programs in I/O Stream classes and threads, as well to connect databases.
CO5	Able to connect client with server programs using RMI and to use web apps in servlets.

COURSE CODE : 21CA1002 COURSE NAME : DBMS LABORATORY	
CO1	Able to Construct ER and DFD Diagram

CO2	Ability to formulate SQL queries and PL/SQL based on the problems given.
CO3	Ability to Implements Joins and Subqueries
CO4	Ability to Normalize the database
CO5	Ability to Practice Block chain Ethereum

COURSE CODE : 21CA1171 **COURSE NAME : COMMUNICATIVE SKILL FOR BUSINESS ENGLISH – I**	
CO1	Know the basics of various ways to communicate a message to the receiver
CO2	Apply the best communication method and use it effectively
CO3	Evaluate different methods of application of message and modify it according to the feedback received.
CO4	Reiterate the received message and ensure that it has been received in the right context and explain it again wherever necessary.
CO5	Participate effectively in formal or informal conversations, message sharing and resolving issues and complaints and reporting of the issues.

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COURSE OUTCOMES (COs)

SEMESTER II

COURSE CODE : 21CA2201 **COURSE NAME: DATA STRUCTURES AND ALGORITHMS**	
CO1	Able to understand the fundamental topics of linear data structures Arrays, Pointers, Structures, Linked Lists, Stack and queues.
CO2	Able to understand different implementation and algorithms related to searching, sorting and Hashing methods
CO3	Able to understand the concept of important data structure like Trees and Graphs.
CO4	Able to understand various algorithmic strategies
CO5	Able to build a complete algorithmic solution to a given problem.

COURSE CODE : 21CA2202 **COURSE NAME : ARTIFICIAL INTELLIGENCE**	
CO1	Remember fundamental understanding of the history of artificial intelligence (AI) and its foundations.
CO2	Understand and Remember the fundamental concepts and methods of Artificial Intelligence.

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CO3	Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
CO4	Understand the basic principles of AI in solutions that require problem solving, perception, knowledge representation, and learning.
CO5	Demonstrate an ability to share in discussions of AI, its current scope and limitations, and societal implications.

COURSE CODE : 21CA2203 COURSE NAME : PYTHON PROGRAMMING	
CO1	Understand the basic concepts of Python Fundamentals.
CO2	Design applications using basic data structures of Python and Regular Expressions.
CO3	To understand the concepts of Exception Handling, OOPs concepts and development of web application with database connectivity
CO4	Implement Data Visualization using various Plotting Tools.
CO5	To Implement Exploratory Data Analysis , Data Preparation and Preprocessing Testing and Training Data set and Model Implementation.

COURSE CODE : 21EC2231 COURSE NAME: EMBEDDED SYSTEM AND SENSORS	
CO1	Write assembly language programs for 8051 Microcontroller.
CO2	Apply the Embedded C Programming and RTOS Concepts to various applications.
CO3	Create and test assembly level programming for ARM Processors
CO4	Explain various interfacing techniques using microcontroller.
CO5	Describe the development and applications of sensors and actuators

COURSE CODE : 21CA2001 COURSE NAME: PYTHON PROGRAMMING LAB	
CO1	Ability to develop python programs using control structures and various data structures.
CO2	Ability to develop simple applications using Strings, functions, Regular Expressions and Packages.
CO3	Ability to develop object oriented programs in python with Exceptional Handling analytics tools for a problem set.
CO4	Able to perform Visualization And data analysis using various tools.
CO5	Ability to Apply various Machine Learning Algorithms for a given data set.

COURSE CODE : 21CA2002 COURSE NAME : DATA STRUCTURES & ALGORITHMS LAB	
CO1	Develop C programs using the basic concepts of data structures and algorithms.
CO2	Able to implement concepts about stacks, queues, lists, trees and graphs.
CO3	Able to design searching and sorting algorithms.
CO4	Able to use various programming constructs such as divide-and-conquer, backtracking, and dynamic programming.
CO5	Develop applications using these data structures.

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST HICET	COURSE OUTCOMES (COs)

SEMESTER III

COURSE CODE : 21CA3203R COURSE NAME : WEB DEVELOPMENT	
CO1	Make use of the recent platforms in developing web applications
CO2	Design applications using J2EE, Servlet, JSP, Spring, ReactJS and Node.js.
CO3	Associate an application with external data and deploy it on server.
CO4	Build interactive, client-side, server-side executable web applications
CO5	Construct database connectivity in Node.js.

COURSE CODE : 21CA3205 COURSE NAME: CRYPTOGRAPHY AND NETWORK SECURITY	
CO1	Understand the fundamentals of networks security, security architecture, threats and vulnerabilities
CO2	Apply the different cryptographic operations of symmetric cryptographic algorithms
CO3	Apply the different cryptographic operations of public key cryptography
CO4	Apply the various Authentication schemes to simulate different applications.
CO5	Understand various Security practices and System security standards.

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COURSE CODE : 21CA3251 COURSE NAME: DATA SCIENCE AND ANALYTICS	
CO1	To have insight into methods in Data Science and Analytics and familiar with the Statistics and probability concepts.
CO2	To develop applications by applying exploratory data Analysis with the modern tools.
CO3	To conduct Investigations on Complex Computing problems by applying various Machine Learning Algorithms.
CO4	To Identify and design modeling of large data
CO5	To work with Big data Platform and data Analytical Frameworks.

COURSE CODE : 21EC3251 COURSE NAME: INTERNET OF THINGS	
CO1	Describe IoT with various tools.
CO2	Design IoT using various methodologies
CO3	Design a portable IoT using Arduino/ equivalent boards and relevant protocols.
CO4	Deploy an IoT application and connect to the cloud using Raspberry Pi.
CO5	Analyze applications of IoT in real time scenario

COURSE CODE : 21CA3001 COURSE NAME: MINI PROJECT	
CO1	Develop skill to create practical solutions to identified problem.
CO2	Use software lifecycle model and other artifacts appropriate for problem.
CO3	Identify and master tools required for the project.
CO4	Plan and work systematically towards completion of a project work.
CO5	Develop the ability to explain and defend their work in front of an evaluation panel.

COURSE CODE : 21CA3002R COURSE NAME: WEB DEVELOPMENT LAB	
CO1	Able to create program for the client and server technologies using servlet
CO2	Able to write applications - oriented web services using JSP
CO3	Able to develop the dependencies by using ReactJS
CO4	Able to build programs using react components
CO5	Able to construct database connectivity using Node.js

HICET	COURSE OUTCOMES (COs)

SEMESTER IV

COURSE CODE : 21CA4901
COURSE NAME : Project Work

HICET	COURSE OUTCOMES (COs)

PROFESSIONAL ELECTIVE - I

COURSE CODE : 21CA2301 COURSE NAME: Cyber Security	
CO1	Understand and analyze the fundamentals of Disk forensics
CO2	Understand and analyze the fundamentals of Software forensics
CO3	Understand and analyze the fundamentals of Network forensics
CO4	Understand and analyze fundamentals of cyber security and relationship between IT and forensics
CO5	Understand and analyze the security investigation

COURSE CODE : 21CA2302 COURSE NAME : Green Computing	
CO1	Acquire knowledge to adopt green computing practices to minimize negative impacts on the environment
CO2	Enhance the skill in energy saving practices in their use of hardware.
CO3	Evaluate technology tools that can reduce paper waste and carbon footprint by the stakeholders
CO4	Understand the ways to minimize equipment disposal requirements.
CO5	To understand the scenarios and strategies of Green computing.

COURSE CODE : 21CA2303
COURSE NAME : HUMAN COMPUTER INTERACTION

CO1	Design effective dialog for HCI.
CO2	Design effective HCI for individuals and persons with disabilities.
CO3	Assess the importance of user feedback
CO4	Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
CO5	Develop meaningful user interface. Develop the recent technologies with real world examples.

COURSE CODE : 21CA2304 COURSE NAME: Professional Ethics	
CO1	Remember the human values and computer ethics.
CO2	Understand the computer crime and the related intellectual property rights
CO3	Apply regulatory and safety concepts in internet.
CO4	Understanding the computer technologies.
CO5	Remember the models software development and quality standards.

COURSE CODE : 21CA2305 COURSE NAME: Web Graphics	
CO1	Understand the Concepts of HTML and simple web site creation using HTML
CO2	Designing web pages using image editing software and its tools
CO3	Creating Flash web site
CO4	Correctly explain a variety of terms relating to web design, HTML, CSS, and Flash
CO5	Design, create, and upload an original website.

COURSE CODE : 21CA2306 COURSE NAME: Digital Logic And Computer Organization	
CO1	Be proficient in number systems and computer arithmetic.
CO2	Design and implement digital systems with basic gates and other components using combinational and sequential circuits.
CO3	Familiarize and understand the organization of memory hierarchies including the basics of cache design and subsystem.
CO4	Understand a machine's Instruction Set Architecture (ISA) including basic instruction fetch and execute cycles, instruction formats and control flow.
CO5	Understand a basic input/output functioning including program controlled I/O, interrupt I/O and analyze the performance of processors and caches.

COURSE CODE : 21CA2307 COURSE NAME: E-Learning Techniques	
CO1	Distinguish the phases of activities in the models of E-learning.

CO2	Identify appropriate instructional methods and delivery strategies.
CO3	Choose appropriate E-learning authoring tools
CO4	Create interactive E-Learning Platforms
CO5	Evaluate and Manage the E-learning course delivery and evaluation methods.

COURSE CODE : 21CA2308 **COURSE NAME: Block Chain Technologies**	
CO1	Understand the technology components of Blockchain and how it works behind the scenes.
CO2	Understand the Bitcoin and its limitations by comparing with other alternative coins.
CO3	Establish deep understanding of the Ethereum model, its consensus model and code execution.
CO4	Understand the architectural components of a Hyper ledger and its development framework.
CO5	Aware of the alternative blockchains and emerging trends in blockchain

Dean (Academics)
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