



DEPARTMENT OF CIVIL ENGINEERING
BTECH COURSE OUTCOMES-R20

YEAR - I		SEMESTER-I
COURSE CODE: R201105		COURSE NAME: ENGINEERING GEOLOGY
COURSE OUTCOMES:		
Upon the successful completion of this course:		
CO1	Identify and classify the geological minerals	
CO2	Measure the rock strengths of various rocks	
CO3	Classify and measure the earthquake prone areas to practice the hazard zonation	
CO4	Classify, monitor and measure the Landslides and subsidence	
CO5	Investigate the project site for mega/mini civil engineering projects. Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc.	
YEAR - I		SEMESTER-II
COURSE CODE: R201205		COURSE NAME: BUILDING MATERIALS AND CONCRETE TECHNOLOGYs
CO1	Know various engineering properties of building construction materials and suggest their suitability	
CO2	Identify the various properties of ingredients of concrete	
CO3	Identify the functional role of ingredients of concrete and apply this knowledge to concrete mix design	
CO4	Acquire and apply fundamental knowledge in the fresh and hardened properties of concrete	
CO5	Knowledge on tests of fresh and hardened concrete	
YEAR - II		SEMESTER-I
COURSE CODE: R2021011		COURSE NAME: MATHEMATICS-III (Vector Calculus, Transforms and PDE
CO1	Interpret the physical meaning of different operators such as gradient, curl and divergence	
CO2	Estimate the work done against a field, circulation and flux using vector calculus	
CO3	Apply the Laplace transform for solving differential equations	



	Determination under various market conditions and also to have the knowledge of different Business Units.
CO4	The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis.
CO5	The Learner can able to evaluate various investment project proposals with the help of Capital budgeting techniques for decision making.
YEAR – III SEMESTER-I	
COURSE CODE: R2031011	
COURSE NAME: Professional Core courses (STRUCTURAL ANALYSIS)	
CO1	Distinguish between the determinate and indeterminate structures.
CO2	Identify the behavior of structures due to the expected loads, including the moving loads, acting on the structure.
CO3	Estimate the bending moment and shear force in beams for different fixity conditions.
CO4	Analyse the continuous beam using various methods – three moment method, slope deflection method energy theorms.
CO5	Analyze the loads in pratt and warren trusses when loads of different types and spans are passing over the truss.
COURSE CODE: R2031012	
COURSE NAME: Professional Core courses (DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES)	
CO1	Work on different types of design methods.
CO2	Carryout analysis and design of flexural members and detailing.
CO3	Design structures subjected to shear, bond and torsion.
CO4	Design different type of compression members and footings.
CO5	Design different types of footings.
COURSE CODE: R2031013	
COURSE NAME: Professional Core courses (GEOTECHNICAL ENGINEERING-1)	
CO1	The will be able to know the definition of the various quantities related to soil mechanics and establish their inter-relationships.
CO2	The student will be able to know the methods of determination of the various index properties of the soils and classify the soils.
CO3	The student will be able to know the importance of the different engineering properties of the soil such as compaction, permeability, consolidation and shear strength and determine them in the laboratory.
CO4	The student will be able to apply the above concepts in day-to-day civil engineering practice.
CO5	The student will be able to know the mechanism of shear strength.
COURSE CODE: R203101A	
COURSE NAME: Professional Elective courses-I Construction Technology & Management	



CO1	The student will be able to basic insights and inputs to the student
CO2	The student will get Professional Ethics instills.
CO3	The student will get knowledge to maintain ethical conduct.
CO4	The student will get to inculcate Human values to grow as responsible human beings with proper personality
CO5	The student will get discharge in their professional duties.
COURSE CODE: R203101J	
COURSE NAME: Open Elective-I Environmental Management	
CO1	Plan and design the water and wastewater systems
CO2	Identify the source of emissions and select proper control systems.
CO3	Design & estimation of water supply system for a city
CO4	To get knowledge about various environmental aspects
CO5	Selection of suitable treatment flow for raw water treatments.
YEAR - III	
SEMESTER-II	
COURSE CODE: R203201I	
COURSE NAME: Professional Core courses (DESIGN AND DRAWING OF STEEL STRUCTURES)	
CO1	Work with relevant IS Codes.
CO2	Carryout analysis and design of flexural members and detailing.
CO3	Design-compression members of different types with connection details
CO4	Design plate girder and gantry girder with connection details.
CO5	Produce the drawings pertaining to different components of steel structures
COURSE CODE: R2032012	
COURSE NAME: Professional Core courses (WATER RESOURCE ENGINEERING)	
CO1	Have a thorough understanding of the theories and principles governing the hydrologic processes.
CO2	Be able to quantify hydrologic components and apply concepts in hydrologic design of water resources projects
CO3	Develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulic structures.
CO4	Develop design-storms and carry out frequency analysis.
CO5	Develop flow mass curve and flow duration curve, apply hydrograph analysis in the design of water resources projects.
COURSE CODE: R2032013	
COURSE NAME: Professional Core courses (GEOTECHNICAL ENGINEERING-II)	
CO1	The student must be able to understand the various types of shallow foundations and decide on their location based on soil characteristics
CO2	The student must be able to compute the magnitude of foundation settlement and decide on the size of the foundation accordingly.
CO3	The student must be able to use the field test data and arrive at the bearing capacity.
CO4	The student must be able to apply the principles of bearing capacity of piles and

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	design them accordingly
CO5	The student should be able to design well and pile foundations
COURSE CODE: R203201C	
COURSE NAME: Professional Elective courses (Road Safety Engineering)	
CO1	To understand fundamental of Traffic Engineering.
CO2	To investigate & determine the collective factors & remedies of accident involved
CO3	To design & planning various road geometrics
CO4	To know the traffic system from road safety point of view.
CO5	To identify accident interrogations & risk involved with measures to identify the causes are dealt.
COURSE CODE: R203201G	
COURSE NAME: Open Elective-2 (Disaster Management)	
CO1	To identify natural hazards and Understand the need and significance of studying disaster management.
CO2	To Understand the different types of disasters and causes for disasters.
CO3	To Study and assess different types vulnerability and its related losses.
CO4	To Understand role of technology and Geographical Information System applications in Disaster Management
CO5	To Gain knowledge in various methods of risk reduction measures and risk mitigation.
YEAR - IV	
SEMESTER-I	
COURSE CODE:	
COURSE NAME: Professional Elective - III (Urban Transportation Planning)	
CO1	Estimate travel demand for an urban area
CO2	Plan the transportation network for a city
CO3	Identify the corridor and plan for providing good transportation facilities.
CO4	Evaluate various alternative transportation proposals
CO5	Know the Corridor Identification, Plan Preparation & Evaluation
COURSE CODE:	
COURSE NAME: Professional Elective - IV (Ground Improvement Techniques)	
CO1	By the end of the course, the student should be able to possess the knowledge of various methods of ground improvement and their suitability to different field situations.
CO2	The student should be in a position to design a reinforced earth embankment and check its stability
CO3	The student should know the various functions of Geo synthetics and their applications in Civil Engineering practice
CO4	The student should be able to understand the concepts and applications of grouting
CO5	To make the student learn the concepts, purpose and effects of grouting.
COURSE CODE:	
COURSE NAME: Professional Elective - V (Design & Drawing of Irrigation Structures)	
CO1	Design and draw hydraulic Surplus weir



CO2	Design and draw Tank sluice with a tower head.
CO3	Design and draw Canal drop-Notch type
CO4	Design and draw Canal regulator
CO5	Design and draw Syphon aqueduct type III

COURSE CODE:	COURSE NAME: Open Elective-III (Safety Engineering)
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CO1	To understand fundamental of Traffic Engineering
CO2	To investigate & determine the collective factors & remedies of accident involved.
CO3	To design & planning various road geometrics
CO4	To massage the traffic system from road safety point of view.
CO5	The various traffic management systems for safety & safety improvement strategies are dealt

COURSE CODE:	COURSE NAME: Open Elective-IV (Remote Sensing & GIS)
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CO1	Be familiar with ground, air and satellite-based sensor platforms.
CO2	Interpret the aerial photographs and satellite imageries.
CO3	Create and input spatial data for GIS application
CO4	Apply RS and GIS concepts for application in Civil Engineering.
CO5	RS and GIS applications

MINOR COURSES

COURSE CODE:	COURSE NAME: MINOR COURSE II& IV(ARCHITECTURE AND TOWN PLANNING)
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CO1	Distinguish architectural styles of eastern and western world
CO2	Understand the importance of Orders of architecture.
CO3	Compose spaces of buildings using design concepts, planning principles.
CO4	Understand the town planning standards, landscaping features and regulations controlling expansion of the towns and the cities.
CO5	Understand the Land scaping for the towns, horizontal and vertical expansion of towns- garden cities, satellite towns

COURSE CODE:	COURSE NAME: MINOR COURSE I&III (GEO INFORMATICS)
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CO1	Understand the basic of Geodesy and Indian Geodetic System
CO2	Analyze and understand the basic of GPS, and data processing
CO3	Analyze and understand the basic of Differential GPS (DGPS)
CO4	Analyze and understand different application of GPS.
CO5	Develop and execute GPS & DGPS related project.

COURSE CODE:	COURSE NAME: MINOR COURSE II & IV (RAILWAY, HARBOUR AND AIRPORT ENGINEERING)
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CO1	Design geometrics in a railway track.
CO2	Plan track layouts and control movement of trains.
CO3	Design airport geometrics and airfield pavements.



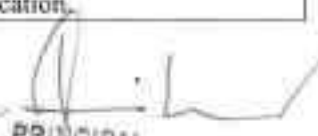
CO4	Plan, construct and maintain Docks and Harbours
CO5	Know the planning, construction and maintenance of Docks and Harbours.
COURSE CODE:	
COURSE NAME: MINOR COURSE I & III (IRRIGATION ENGINEERING)	
CO1	Have knowledge and skills on crop water requirements
CO2	Understand the methods and management of irrigation.
CO3	Gain knowledge on types of Impounding structures
CO4	Understand methods of irrigation including canal irrigation.
CO5	Get knowledge on water management on optimization of water use.


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DEPARTMENT OF MECHANICAL ENGINEERING		
YEAR: II nd		SEMESTER: Ist COURSE OUTCOMES(R20)
S.No	COURSE CODE: R2021011	COURSE NAME: VECTOR CALCULUS FOURIER TRANSFORMS and PDE (M-III)
1	CO1: Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)	
	CO2: Estimate the work done against a field, circulation and flux using vector calculus (L5)	
	CO3: Apply the Laplace transform for solving differential equations (L3)	
	CO4: Find or compute the Fourier series of periodic signals (L3)	
	CO5: Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)	
	CO6: Identify solution methods for partial differential equations that model physical processes (L3)	
	COURSE CODE: R2021031	COURSE NAME: MECHANICS OF SOLIDS
2	CO1: Model & Analyze the behavior of basic structural members subjected to various loading and support conditions based on principles of equilibrium.	
	CO2: Understand the apply the concept of stress and strain to analyze and design structural members and machine parts under axial, shear and bending loads, moment and torsional moment.	
	CO3: Students will learn all the methods to analyze beams, columns, frames for normal, shear, and torsion stresses and to solve deflection problems in preparation for the design of such structural components. Students are able to analyse beams and draw correct and complete shear and bending moment diagrams for beams.	
	CO4: Students attain a deeper understanding of the loads, stresses, and strains acting on a structure and their relations in the elastic behavior	
	CO5: Design and analysis of Industrial components like pressure vessels.	
	COURSE CODE: R2021032	COURSE NAME: FLUID MECHANICS & HYDRAULIC MACHINES
3	CO1: The basic concepts of fluid properties.	
	CO2: The mechanics of fluids in static and dynamic conditions.	
	CO3: Boundary layer theory, flow separation and dimensional analysis.	
	CO4: Hydrodynamic forces of jet on vanes in different positions.	
	CO5: Working Principles and performance evaluation of hydraulic pump and turbines.	
	COURSE CODE: R2021033	COURSE NAME: PRODUCTION TECHNOLOGY
4	CO1: Able to design the patterns and core boxes for metal casting processes	
	CO2: Able to design the gating system for different metallic components	
	CO3: Know the different types of manufacturing processes	
	CO4: Be able to use forging, extrusion processes	
	CO5: Learn about the different types of welding processes used for special fabrication.	


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	COURSE CODE: R2021034	COURSE NAME: KINEMATICS OF MACHINERY
5	CO1: Conceive a mechanism for a given plane motion with single degree of freedom.	
	CO2: Suggest and analyze a mechanism for a given straight line motion and automobile steering motion.	
	CO3: Analyze the motion (velocity and acceleration) of a plane mechanism.	
	CO4: Suggest and analyze mechanisms for a prescribed intermittent motion like opening and closing of IC engine valves etc.	
	CO5: Select a power transmission system for a given application and analyze motion of different transmission systems.	
	COURSE CODE: R2021035	COURSE NAME: COMPUTER AIDED ENGINEERING DRAWING PRACTICE
6	CO1: Student get exposed on working of sheet metal with help of development of surfaces.	
	CO2: Student understands how to know the hidden details of machine components with the help of sections and interpenetrations of solids.	
	CO3: Student shall exposed to modeling commands for generating 2D and 3D objects using computer aided drafting tools which are useful to create machine elements for computer aided analysis.	



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DEPARTMENT OF MECHANICAL ENGINEERING		
YEAR: II nd	SEMESTER: II nd	COURSE OUTCOMES(R20)
S.No	COURSE CODE: R2022031	COURSE NAME: MATERIALS SCIENCE & METALLURGY
1	CO1: Understand the crystalline structure of different metals and study the stability of phases in different alloy systems.	
	CO2: Study the behavior of ferrous and non ferrous metals and alloys and their application in different domains	
	CO3: Able to understand the effect of heat treatment, addition of alloying elements on properties of ferrous metals.	
	CO4: Grasp the methods of making of metal powders and applications of powder metallurgy	
	CO5: Comprehend the properties and applications of ceramic, composites and other advanced methods.	
	COURSE CODE: R2022011	COURSE NAME: COMPLEX VARIABLES AND STATISTICAL METHODS
2	CO1: Apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic (L3)	
	CO2: Find the differentiation and integration of complex functions used in engineering problems (L5)	
	CO3: Make use of the Cauchy residue theorem to evaluate certain integrals (L3)	
	CO4: Apply discrete and continuous probability distributions (L3)	
	CO5: Design the components of a classical hypothesis test (L6)	
	CO6: Infer the statistical inferential methods based on small and large sampling tests (L4)	
	COURSE CODE: R2022032	COURSE NAME: DYNAMICS OF MACHINERY
3	CO1: To compute the frictional losses and transmission in clutches, brakes and dynamometers	
	CO2: To determine the effect of gyroscopic couple in motor vehicles, ships and aeroplanes	
	CO3: To analyze the forces in four bar and slider crank mechanisms and design a fly wheel	
	CO4: To determine the rotary unbalanced mass in reciprocating equipment	
	CO5: To determine the unbalanced forces and couples in reciprocating and radial engines	
	CO6: To determine the natural frequencies of discrete systems undergoing longitudinal, torsional and transverse vibrations.	
	COURSE CODE: R2022033	COURSE NAME: THERMAL ENGINEERING - I
4	CO1: Derive the actual cycle from fuel-air cycle and air- standard cycle for all practical applications.	
	CO2: Explain working principle and various components of IC engine	
	CO3: Explain combustion phenomenon of CI and SI engines and their impact on engine variables.	
	CO4: Analyze the performance of an IC engine based on the performance parameters.	
	CO5: Explain the cycles and systems of a gas turbine and determine the efficiency of gas turbine.	
	CO6: Explain the applications and working principle of rockets and jet propulsion	


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	COURSE CODE: R2022034	COURSE NAME: INDUSTRIAL ENGINEERING AND MANAGEMENT
5	CO1: Design and conduct experiments, analyse, interpret data and synthesize valid conclusions	
	CO2: Design a system, component, or process, and synthesize solutions to achieve desired needs	
	CO3: Use the techniques, skills, and modern engineering tools necessary for engineering practice with appropriate considerations for public health and safety, cultural, societal, and environmental constraints.	
	CO4: Function effectively within multi-disciplinary teams and understand the fundamental precepts of effective project management	
	COURSE CODE: R2022036	COURSE NAME: MACHINE DRAWING PRACTICE
6	CO1: Draw and represent standard dimensions of different mechanical fasteners and joints and Couplings.	
	CO2: Draw different types of bearings showing different components.	
	CO3: Assemble components of a machine part and draw the sectional assembly drawing showing the dimensions of all the components of the assembly as per bill of materials	
	CO4: Select and represent fits and geometrical form of different mating parts in assembly drawings.	
	CO5: To prepare manufacturing drawings indicating fits, tolerances, surface finish and surface treatment requirements.	


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DEPARTMENT OF MECHANICAL ENGINEERING		
YEAR: IIIrd	SEMESTER: 1st	COURSEOUTCOMES(R20)
S.No	COURSE CODE: R2031031	COURSE NAME: THERMAL ENGINEERING-II
1	CO1: Explain the basic concepts of thermal engineering and boilers.	
	CO2: Discuss the concepts of steam nozzles and steam turbines.	
	CO3: Gain knowledge about the concepts of reaction turbine and steam condensers.	
	CO4: Discuss the concepts of reciprocating and rotary type of compressors.	
	CO5: Acquire knowledge about the centrifugal and axial flow compressors.	
	COURSE CODE: R2031032	COURSE NAME: DESIGN OF MACHINE MEMBERS-I
2	CO1: Judge about materials and their properties along with manufacturing considerations.	
	CO2: Gain knowledge about the strength of machine elements.	
	CO3: Apply the knowledge in designing the riveted and welded joints, keys, cotters and knuckle joints.	
	CO4: Apply the knowledge in designing the shafts and shaft couplings.	
	CO5: Apply the knowledge in designing the mechanical springs.	
	COURSE CODE: R2031033	COURSE NAME: MACHINING, MACHINE TOOLS & METROLOGY
3	CO1: Discuss the concepts of machining processes.	
	CO2: Apply the principles of lathe, shaping, slotting and planing machines.	
	CO3: Apply the principles of drilling, milling and boring processes.	
	CO4: Analyze the concepts of finishing processes and the system of limits and fits.	
	CO5: Learn the concepts of surface roughness and optical measuring instruments.	
	COURSE CODE: R203103G	COURSE NAME: SUSTAINABLE ENERGY TECHNOLOGIES (OE-1)
4	CO1: Explain the importance of solar energy collection and storage.	
	CO2: Apply the principles of wind energy and biomass energy.	
	CO3: Analyze knowledge on geothermal and ocean energy.	
	CO4: Justify the knowledge about energy efficient systems.	
	CO5: Discuss the concepts of green manufacturing systems.	
	COURSE CODE: R203103H	COURSE NAME: OPERATIONS RESEARCH (OE-1)
5	CO1: Apply the basics of operations research and linear programming problems.	
	CO2: Apply the knowledge in solving problems of transportation, assignment and sequencing.	
	CO3: Judge the replacement and game theories and apply the knowledge to solve problems.	
	CO4: Discuss the waiting line models and project management techniques.	
	CO5: Apply the knowledge in solving problems of dynamic programming and simulation.	

	COURSE CODE: R2031031	COURSE NAME: NANO TECHNOLOGY (OE-1)
6	CO1: Explain about nano-structured materials and their applications.	
	CO2: Apply knowledge about the nano crystalline materials, their properties and defects.	
	CO3: Justify various techniques of nanofabrication.	
	CO4: Apply the tools to characterize nano materials.	
	CO5: Analyze the applications of nano materials.	
	COURSE CODE: (OE-1)	COURSE NAME: THERMAL MANAGEMENT OF ELECTRONIC SYSTEMS (OE-1)
7	CO1: Apply the basics of heat transfer and analyze heat transfer through fins	
	CO2: Analyze the basics of convection and radiation modes of heat transfer.	
	CO3: Analyze knowledge about the thermal analysis of printed circuit boards and their cooling.	
	CO4: Explain the principles of two-phase cooling and heat pipes.	
	CO5: Justify knowledge about the thermoelectric coolers.	
	COURSE CODE: R203103A	COURSE NAME: FINITE ELEMENT METHODS (PE-1)
8	CO1: Apply basic principles of finite element methods.	
	CO2: Analyze about discretization principles and apply to analyse the trusses.	
	CO3: Apply the finite element method to analyze and solve beam problems.	
	CO4: Judge the knowledge about two dimensional stress analysis.	
	CO5: Apply steady state and dynamic analysis.	
	COURSE CODE: R203103B	COURSE NAME: INDUSTRIAL ROBOTICS (PE-1)
9	CO1: Perceive the concepts of robotics and its systems.	
	CO2: Apply knowledge about the motion analysis and manipulator kinematics.	
	CO3: Analyze the differential transformations.	
	CO4: Apply the basics about path description and generation.	
	CO5: Judge about the actuators, feedback components and robotic applications.	
	COURSE CODE: R203103C	COURSE NAME: ADVANCED MATERIALS (PE-1)
10	CO1: Justify the knowledge about metals and alloys and their utility in different environments.	
	CO2: Judge about polymers and ceramics and their applications.	
	CO3: Analyze composite materials along with reinforcements and their applications.	
	CO4: Utilize shape memory alloys and functionally graded materials for different applications.	
	CO5: Justify about the nanomaterials and their applications.	
	COURSE CODE: R203103D	COURSE NAME: RENEWABLE ENERGY SOURCES (PE-1)
11	CO1: Explain the importance of, solar energy collection and storage.	
	CO2: Discuss the wind energy principles.	
	CO3: Analyze about biomass energy concepts.	
	CO4: Apply the principles of tidal energy.	
	CO5: Utilize the concepts of geothermal energy.	


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	COURSE CODE: (PE-1)	COURSE NAME: MECHANICS OF COMPOSITES (PE-1)
12	CO1: Discuss the composite materials and their classification.	
	CO2: Apply the micro mechanical analysis of a lamina.	
	CO3: Learn about two dimensional angle lamina.	
	CO4: Apply the macro mechanical analysis of a lamina.	
	CO5: Utilize knowledge in designing the laminates.	
	COURSE CODE: R2031034	COURSE NAME: MACHINE TOOLS LABORATORY
13	CO1: Demonstrate about general purpose machine tools in the machine shop.	
	CO2: Perform various operations on lathe machine.	
	CO3: Perceive different operations on drilling machine.	
	CO4: Experiment with basic operations on shaping machine.	
	CO5: Utilize slotting machine to make keyways.	
	CO6: Experiment with the basic operations on milling machine.	
	COURSE CODE: R2031035	COURSE NAME: THERMAL ENGINEERING LAB
14	CO1: Experiment with two stroke and four stroke compression and spark ignition engines for various characteristics.	
	CO2: Perceive flash point, fire point, calorific value of different fuels using various apparatus.	
	CO3: Perform engine friction, heat balance test, volumetric efficiency, load test of petrol and diesel engines.	
	CO4: Perform speed test, performance test and cooling temperature on petrol and diesel engines.	
	CO5: Utilize air compressor for its performance test and to determine efficiency.	
	CO6: Discuss the principles through assembly and disassembly of 2/3 wheelers, 2/4 stroke engines, tractor, heavy duty engines, boilers and their mountings and accessories.	
	COURSE CODE: R2031037	COURSE NAME: PROFESSIONAL ETHICS AND HUMAN VALUES
15	CO1: Judge the concepts of human values.	
	CO2: Justify knowledge about the principles of engineering ethics.	
	CO3: Interpret engineering as social experimentation.	
	CO4: Realize engineers' responsibility for safety and risk.	
	CO5: Learn about the engineers' rights and responsibilities.	
	COURSE CODE: R2031036	COURSE NAME: ADVANCED COMMUNICATION SKILLS LAB
16	CO1: Acquire vocabulary and use it contextually.	
	CO2: Listen and speak effectively.	
	CO3: Develop proficiency in academic reading and writing.	
	CO4: Increase possibilities of job prospects.	


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YEAR: IIIrd		SEMESTER: IInd
COURSE OUTCOMES(R20)		
S.No	COURSE CODE: R2032031	COURSE NAME: HEAT TRANSFER
1	CO1: Apply knowledge about mechanism and modes of heat transfer.	
	CO2: Understand the concepts of conduction and convective heat transfer.	
	CO3: Learn about forced and free convection.	
	CO4: Analyze the concepts of heat transfer with phase change and condensation along with heat exchangers.	
	CO5: Interpret the knowledge about radiation mode of heat transfer.	
	COURSE CODE: R2032032	COURSE NAME: DESIGN OF MACHINE MEMBERS-II
2	CO1: Apply knowledge about the design of bearings.	
	CO2: Explain the concepts in designing various engine parts.	
	CO3: Utilize the knowledge to design curved beams and power screws.	
	CO4: Justify power transmission systems and to design pulleys and gear drives.	
	CO5: Apply the concepts in designing various machine tool elements.	
	COURSE CODE: R2032033	COURSE NAME: INTRODUCTION TO ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
3	CO1: Discuss basic concepts of artificial intelligence, neural networks and genetic algorithms.	
	CO2: Apply the principles of knowledge representation and reasoning.	
	CO3: Learn about bayesian and computational learning and machine learning.	
	CO4: Utilize various machine learning techniques.	
	CO5: Apply the machine learning analytics and deep learning techniques.	
	COURSE CODE: R203203A	COURSE NAME: AUTOMOBILE ENGINEERING (PE-2)
4	CO1: Discuss various components of four wheeler automobile.	
	CO2: Apply the knowledge of different parts of transmission system.	
	CO3: Judge about steering and suspension systems.	
	CO4: Justify the braking system and electrical system used in automobiles.	
	CO5: Analyze the concepts about engine specifications and service, safety and electronic system used in automobiles.	
	COURSE CODE: R203203B	COURSE NAME: SMART MANUFACTURING (PE-2)
5	CO1: Apply the basic concepts of smart manufacturing.	
	CO2: Analyze about smart machines and sensors.	
	CO3: Utilize the principles of IoT connectivity to industry 4.0.	
	CO4: Perceive about digital twin and its applications and machine learning and artificial intelligence in manufacturing.	
	CO5: Learn the basic concepts of metaverse.	


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	COURSE CODE: R203203C	COURSE NAME: ADVANCED MECHANICS OF SOLIDS (PE-2)
6	CO1: Explain the principles of failure criteria.	
	CO2: Determine the stresses and deflection in unsymmetrical bending of beams.	
	CO3: Apply the knowledge about curved beam theory.	
	CO4: Interpret the concept of torsion.	
	CO5: Analyze the contact stresses.	
	COURSE CODE: R203203D	COURSE NAME: STATISTICAL QUALITY CONTROL (PE-2)
7	CO1: Discuss the concepts of quality systems and quality engineering in design and processes.	
	CO2: Utilize knowledge about the statistical process control charts and sampling techniques.	
	CO3: Analyze the loss function and quality function deployment.	
	CO4: Judge the models of reliability engineering.	
	CO5: Apply knowledge about the concepts of complex system and reliability engineering techniques.	
	COURSE CODE: R203203E	COURSE NAME: INDUSTRIAL HYDRAULICS AND PNEUMATICS (PE-2)
8	CO1: Discuss the principles and laws of fluid power.	
	CO2: Judge the hydraulic and pneumatic elements and their accessories.	
	CO3: Analyze and design the hydraulic and pneumatic circuits.	
	CO4: Apply the principles of hydraulic and pneumatic devices.	
	CO5: Analyze knowledge about installation, maintenance and trouble shooting of hydraulic and pneumatic systems.	
	COURSE CODE: R203203G	COURSE NAME: INDUSTRIAL ROBOTICS (OE-2)
9	CO1: Explain the basic concepts and components of industrial robotics and automation.	
	CO2: Judge the knowledge about robot actuators and feedback components.	
	CO3: Analyze the motion of robot and manipulator kinematics.	
	CO4: Analyze the general considerations of path description and generation.	
	CO5: Utilize knowledge about the image processing, machine vision and robotic applications.	
	COURSE CODE: R203203H	COURSE NAME: ESSENTIALS OF MECHANICAL ENGINEERING (OE-2)
10	CO1: Discuss the concepts about stresses and strains.	
	CO2: Justify about the components of transmission systems.	
	CO3: Analyze Problems related to project management techniques.	
	CO4: Utilize knowledge about manufacturing processes and materials.	
	CO5: Learn the concepts of boilers, steam power plant, petrol and diesel engines.	
	COURSE CODE: R203203I	COURSE NAME: ADVANCED MATERIALS (OE-2)
11	CO1: Explain the metals and alloys and their utility in different environments.	
	CO2: Learn about polymers and ceramics and their applications.	
	CO3: Analyze composite materials along with reinforcements and their applications.	
	CO4: Apply the basics of shape memory alloys and functionally graded materials.	
	CO5: Analyze the knowledge about the nano materials and their applications.	


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	COURSE CODE: R203203J	COURSE NAME: INTRODUCTION TO AUTOMOBILE ENGINEERING (OE-2)
12	CO1: Explain various components of a four wheeler automobile.	
	CO2: Discuss the different parts of transmission system.	
	CO3: Justify the concepts of steering and suspension systems.	
	CO4: Utilize the knowledge about the braking system and electrical system used in automobiles.	
	CO5: Analyze the concepts about engine specifications and service, safety of automobiles.	
	COURSE CODE: R2032034	COURSE NAME: HEAT TRANSFER LAB
13	CO1: Determine the heat transfer rate and coefficient.	
	CO2: Determine the thermal conductivity, efficiency and effectiveness.	
	CO3: Determine the emissivity and Stefan-Boltzman constant.	
	CO4: Determine critical heat flux and investigate Lambert's cosine law.	
	CO5: Experiment with Virtual labs and analyse conduction, HT coefficient.	
	CO6: Experiment with Virtual labs and investigate Lambert's laws.	
	COURSE CODE: R2032035	COURSE NAME: CAE & CAM Lab
14	CO1: Experiment with trusses and beams to determine stress, deflection, natural frequencies, harmonic analysis, HT analysis and buckling analysis.	
	CO2: Create part programmes using FANUC controller.	
	CO3: Apply G-codes for automated tool path using CAM software.	
	CO4: Analyze about rapid prototyping machine and to print simple parts.	
	CO5: Experiment with virtual 3D printing simulation using V-labs.	
	COURSE CODE: R2032036	COURSE NAME: Measurements & Metrology lab
15	CO1: Demonstrate the calibration experiments with different gauges, transducers, thermo couple and temperature detector.	
	CO2: Demonstrate the calibration experiments with rotameter, seismic apparatus.	
	CO3: Demonstrate the calibration experiments with vernier calipers, micrometer, height and dial gauges.	
	CO4: Analyze various machine tools for their alignment.	
	CO5: Measure angular and taper measurements, straightness, surface roughness.	
	COURSE CODE: R2032038	COURSE NAME: RESEARCH METHODOLOGY
16	CO1: Understand objectives and characteristics of a research problem	
	CO2: Analyze research related information and to follow research ethics.	
	CO3: Understand the types of intellectual property rights.	
	CO4: Learn about the scope of IPR.	
	CO5: Understand the new developments in IPR.	


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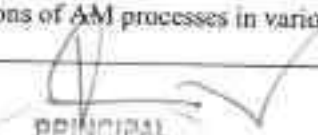


DEPARTMENT OF MECHANICAL ENGINEERING		
YEAR: IVth	SEMESTER: Ist	COURSE OUTCOMES(R20)
S.No	COURSE CODE: (PE-3)	COURSE NAME: MECHANICAL VIBRATIONS (PE-3)
1	CO1: Understand the concepts of vibrational analysis	
	CO2: Understand the concepts of free and forced multi degree freedom systems.	
	CO3: Summarize the concepts of torsional vibrations	
	CO4: Solve the problems on critical speed of shafts	
	CO5: Apply and Analyze the systems subjected to Laplace transformations response to different inputs	
	COURSE CODE: (PE-3)	COURSE NAME: OPERATIONS RESEARCH (PE-3)
2	CO1: Understand Linear Programming models.	
	CO2: Interpret Transportation and sequencing problems.	
	CO3: Solve replacement problems and analyze queuing models.	
	CO4: Understand game theory and inventory problems.	
	CO5: Interpret dynamic programming and simulation.	
	COURSE CODE: (PE-3)	COURSE NAME: UNCONVENTIONAL MACHINING PROCESSES (PE-3)
3	CO1: Understand the concepts of modern machining processes.	
	CO2: Learn the principles of ultrasonic machining.	
	CO3: Apply the principles and procedure of electro chemical and chemical machining processes.	
	CO4: Apply the principles and procedure of thermal metal removal processes	
	CO5: Illustrate the principles and procedure of electron beam machining, laser beam machining and plasma machining.	
	COURSE CODE: (PE-3)	COURSE NAME: COMPUTATIONAL FLUID DYNAMICS (PE-3)
4	CO1: Explain elementary details and numerical techniques for solving various engineering problems involving fluid flow.	
	CO2: Study about finite difference applications in heat conduction and convection.	
	CO3: Apply finite difference for flow modeling.	
	CO4: Understand the concepts of finite volume method.	
	CO5: Understand the concepts of finite element method applied to heat transfer problems.	
	COURSE CODE: (PE-4)	COURSE NAME: AUTOMATION IN MANUFACTURING (PE-4)
5	CO1: Understands the types and strategies and various components in Automated Systems.	
	CO2: Classify the types of automated flow lines and analyze automated flow lines	
	CO3: Solves the line balancing problems in the various flow line systems with and without buffer storage	
	CO4: Interpret different automated material handling systems, storage and retrieval systems and automated inspection systems.	
	CO5: Understand the principles of Adaptive Control systems and recognize the types of automated inspection techniques and their applications	

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	COURSE CODE: (PE-4)	COURSE NAME: POWER PLANT ENGINEERING (PE-4)
6	CO1: Identify the different components of the steam power plant for power production.	
	CO2: Illustrate the component used in the diesel and gas power plant for power production	
	CO3: Understand how the power is produced by hydro-electric and nuclear power plants	
	CO4: Interpret the power production by combined power plants and operating principles of different instruments used in power plants.	
	CO5: Analyze power plant economics and implementation of pollution standards and control of pollution caused by the power plants.	
	COURSE CODE: (PE-4)	COURSE NAME: BIG DATA ANALYTICS (PE-4)
7	CO1: Understand the characteristics of big data and concepts of Hadoop ecosystem.	
	CO2: Design programs for big data applications using Hadoop components.	
	CO3: Apply Map reduce programming model to process big data.	
	CO4: Analyze Spark and its uses for big data processing.	
	CO5: Apply the concepts of NOSQL databases.	
	COURSE CODE: (PE-4)	COURSE NAME: Production Planning and Control (PE-4)
8	CO1: To understand the different types of production systems and the internal organization of production planning and control.	
	CO2: To estimate forecasts in the manufacturing and service sectors using selected quantitative and qualitative techniques.	
	CO3: To understands the importance and function of inventory and to be able to apply for its control and management.	
	CO4: To apply routing procedures and differentiate schedule and loading and interpret scheduling policies and aggregate planning.	
	CO5: To understand dispatching procedure and applications of computers in production planning and control.	
	COURSE CODE: (PE-4)	COURSE NAME: CONDITION MONITORING (PE-4)
9	CO1: Understand the basics of vibration.	
	CO2: Analyze vibration measurement and analysis using transducers and mounting methods.	
	CO3: Understand fault diagnosis and interpret vibration measurements.	
	CO4: Understand oil and wear debris analysis.	
	CO5: Interpret Ultrasonic monitoring and analysis.	
	COURSE CODE: (PE-5)	COURSE NAME: ADVANCED MANUFACTURING PROCESSES (PE-5)
10	CO1: Understand the working principles of various surface coating methods.	
	CO2: Discuss novel and promising techniques in the processing of ceramics and composites.	
	CO3: Select suitable fabrication methods for MEMS components.	
	CO4: Learn the concepts and principles of nano manufacturing methods.	
	CO5: Illustrate the working principles of RP and select appropriate RP process for the application.	

	COURSE CODE: (PE-5)	COURSE NAME: MECHATRONICS (PE-5)
11	CO1: Understand the use the various mechatronics systems, measurement systems, sensors and transducers.	
	CO2: Apply the concepts of solid state electronic devices.	
	CO3: Identify the components in the design of electro mechanical systems.	
	CO4: Apply the concepts of digital electronics and applications of PLCs for control.	
	CO5: Understand system interfacing, data acquisition and design of mechatronics systems.	
	COURSE CODE: (PE-5)	COURSE NAME: REFRIGERATION & AIR-CONDITIONING (PE-5)
12	CO1: Illustrate the operating cycles and different systems of refrigeration.	
	CO2: Analyze cooling capacity and coefficient of performance of vapour compression refrigeration systems and understand the fundamentals of cryogenics.	
	CO3: Calculate coefficient of performance by conducting test on vapour absorption and steam jet refrigeration systems and understand the properties of refrigerants.	
	CO4: Solve cooling load for air conditioning systems and identify the requirements of comfort air conditioning.	
	CO5: Demonstrate different components of refrigeration and air conditioning systems.	
	COURSE CODE: (PE-5)	COURSE NAME: ADDITIVE MANUFACTURING (PE-5)
13	CO1: Understand the principles of prototyping, classification of RP processes and liquid-based RP systems.	
	CO2: Understand and apply different types of solid-based RP systems.	
	CO3: Apply powder-based RP systems.	
	CO4: Analyze and apply various rapid tooling techniques.	
	CO5: Understand different types of data formats and explore the applications of AM processes in various fields.	
	COURSE CODE: (PE-5)	COURSE NAME: NON DESTRUCTIVE EVALUATION (PE-5)
14	CO1: Understand the concepts of various NDE techniques and the requirements of radiography techniques and safety aspects.	
	CO2: Interpret the principles and procedure of ultrasonic testing. (BL-2).	
	CO3: Understand the principles and procedure of Liquid penetration and eddy current testing.	
	CO4: Illustrate the principles and procedure of Magnetic particle testing.	
	CO5: Interpret the principles and procedure of infrared testing and thermal testing.	
	COURSE CODE: (OE-3)	COURSE NAME: ADDITIVE MANUFACTURING (OE-3)
15	CO1: Understand the principles of prototyping, classification of RP processes and liquid-based RP systems.	
	CO2: Understand and apply different types of solid-based RP systems.	
	CO3: Apply powder-based RP systems.	
	CO4: Analyze and apply various rapid tooling techniques.	
	CO5: Understand different types of data formats and explore the applications of AM processes in various fields.	


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	COURSE CODE: (OE-3)	COURSE NAME: MECHATRONICS (OE-3)
16	CO1: Understand the use the various mechatronics systems, measurement systems, sensors and transducers	
	CO2: Apply the concepts of solid state electronic devices.	
	CO3: Identify the components in the design of electro mechanical systems.	
	CO4: Apply the concepts of digital electronics and applications of PLCs for control.	
	CO5: Understand system interfacing, data acquisition and design of mechatronics systems.	
	COURSE CODE: (OE-3)	COURSE NAME: FINITE ELEMENT METHODS (OE-3)
17	CO1: Learn basic principles of variational methods	
	CO2: Learn the principles of Weighted residual methods.	
	CO3: Understand the basic procedure of finite element method	
	CO4: Learn finite element modeling of two dimensional analysis	
	CO5: Learn the finite modeling using high order and isoparametric elements	
	COURSE CODE: (OE-3)	COURSE NAME: INTRODUCTION TO ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (OE-3)
18	CO1: Discuss basic concepts of artificial intelligence, neural networks and genetic algorithms.	
	CO2: Apply the principles of knowledge representation and reasoning.	
	CO3: Learn about bayesian and computational learning and machine learning.	
	CO4: Utilize various machine learning techniques.	
	CO5: Apply the machine learning analytics and deep learning techniques.	
	COURSE CODE: (OE-4)	COURSE NAME: OPTIMIZATION TECHNIQUES (OE-4)
19	CO1: Understand classification of optimization problem and apply classical optimization techniques	
	CO2: Apply unconstrained optimization techniques using various methods	
	CO3: Understand the characteristics and approaches of constrained optimization techniques	
	CO4: Identify optimized solutions using constrained and unconstrained geometric programming.	
	CO5: Understand integer programming methods.	
	COURSE CODE: (OE-4)	COURSE NAME: SMART MANUFACTURING (OE-4)
20	CO1: Learn about smart manufacturing systems' components and can handle it more effectively in context of Industry 4.0	
	CO2: Learn about the smart machines and smart sensors	
	CO3: Apply IoT to Industry 4.0 and they are able to make a system tailor-made as per requirement of the industry	
	CO4: Learn about concepts of Digital Twin and able to apply Machine Learning and Artificial Intelligence concepts in Manufacturing	
	CO5: Learn the concepts of AR/VR and Metaverse platform	
	COURSE CODE: (OE-4)	COURSE NAME: SAFETY ENGINEERING (OE-4)
21	CO1: Students learn the concepts of industrial safety and management.	
	CO2: Learn about the smart machines and smart sensors	
	CO3: Apply IoT to Industry 4.0 and they are able to make a system tailor-made as per requirement of the industry	


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	CO4: Students learn about fire prevention and protection systems.
	CO5: Students learn and apply the fire safety principles in buildings
	COURSE CODE: (OE-4) COURSE NAME: OPERATIONS MANAGEMENT (OE-4)
22	CO1: Apply appropriate forecasting techniques & Aggregate planning methods
	CO2: Learn Materials management analysis and scheduling policies
	CO3: Learn about the inventory control techniques, MRP and contemporary management techniques.
	CO4: Apply quality management principles proposed by Taguchi, Juran & Deming
	CO5: Apply optimization to LP model & transportation and assignment problems
	COURSE CODE: COURSE NAME: MECHATRONICS LAB
23	CO1: Understand the Characteristics of LVDT
	CO2: Measure load, displacement and temperature using analogue and digital sensors.
	CO3: Develop PLC programs for control of traffic lights, water level, lifts and conveyor belts.
	CO4: Simulate and analyze PID controllers for a physical system using MATLAB.
	CO5: Develop pneumatic and hydraulic circuits using Automaton studio.


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DEPARTMENT OF MECHANICAL ENGINEERING

SUBJECTS FOR B.Tech (HONORS) in MECHANICAL ENGINEERING (R20)

S.No	COURSE CODE:	COURSE NAME: ADVANCED MECHANICS OF FLUIDS
1	CO 1: Understand the general concepts of in viscid flow of incompressible fluids.	
	CO 2: Apply the concepts of viscous flow.	
	CO 3: Analyse the boundary layer concepts and expressions for local and mean drag coefficients for different velocity profiles.	
	CO 4: Understand fundamental concept of turbulence.	
	CO 5: Illustrate the compressible fluid flow and supersonic wave drag	
	COURSE CODE:	COURSE NAME: GREEN MANUFACTURING
2	CO 1: Understand concepts of green manufacturing.	
	CO 2: Illustrate various recycling techniques.	
	CO 3: Apply concepts of green design methods.	
	CO 4: Understand the concepts of eco design and emission less manufacturing.	
	CO 5: Apply concepts of the sustainable economic environment.	
	COURSE CODE:	COURSE NAME: ANALYSIS AND SYNTHESIS OF MECHANISMS
3	CO 1: Understand the general concepts of advanced kinematics of plane motion-I.	
	CO 2: Apply the concepts of advanced kinematics of plane motion-II.	
	CO 3: Understand the introduction to synthesis-graphical methods – I with function and path generation.	
	CO 4: Analyze the synthesis-graphical methods with Velocity – pole method and Roberts’s theorem.	
	CO 5: Illustrate the synthesis of four-bar mechanisms for prescribed extreme values of the angular velocity of driven link.	
	COURSE CODE:	COURSE NAME: ALTERNATIVE FUELS TECHNOLOGIES
4	CO 1: Understand significance of fossil fuels and their limitations.	
	CO 2: Apply the concepts of methods of production of various liquid alternative fuels.	
	CO 3: Analyze different ways of using alternative liquid fuels in engines.	
	CO 4: Illustrate the concepts of usage of gaseous fuels in alternative fuels technologies.	
	CO 5: Understand principles of dual fuel combustion, hybrid power plants and fuel cell.	
	COURSE CODE:	COURSE NAME: GEAR ENGINEERING
5	CO 1: To understand the Principles of gear tooth action and spur gears.	
	CO 2: To illustrate the concepts of helical and bevel gears.	
	CO 3: To interpret the design considerations and methodology of worm gear teeth and gear failures.	
	CO 4: To analyze design of gear trains for various applications.	

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		CO 5: To understand the optimization of gear design parameters.
	COURSE CODE:	COURSE NAME: EXPERIMENTAL METHODS IN FLUID MECHANICS
6		CO 1: Understand general concepts of measurement systems and analysis of first order and second order measurement systems
		CO 2: Identify the operating principles and design considerations of various pressure measurement systems.
		CO 3: Understands the operating principles and design considerations of various temperature measurement systems.
		CO 4: Apply the operating principles and design considerations of various flow and velocity measurement systems
		CO 5: Illustrate the working of different voltage indicating, recording and data acquisition systems.
	COURSE CODE:	COURSE NAME: ADVANCED OPTIMIZATION TECHNIQUES
7		CO 1: Understand the Engineering applications of optimization.
		CO 2: Apply the concepts of unconstrained optimization techniques.
		CO 3: Understand the concepts of constrained optimization techniques.
		CO 4: Apply concepts of geometric programming problems.
		CO 5: Analyze multistage decision processes and dynamic programming problems.
	COURSE CODE:	COURSE NAME: MICRO ELECTRO MECHANICAL SYSTEMS
8		CO 1: To understand basics of Micro Electro Mechanical Systems (MEMS), mechanical sensors and actuators.
		CO 2: Illustrate thermal sensors and actuators used in MEMS.
		CO 3: To apply the principle and various devices of Micro-Opto-Electro Mechanical Systems (MOEMS), magnetic sensors and actuators.
		CO 4: Analyze applications and considerations on micro fluidic systems.
		CO 5: Illustrate the principles of chemical and bio medical micro systems.
	COURSE CODE:	COURSE NAME: TRIBOLOGY
9		CO 1: Learn the concepts of surface topography and types of lubrication.
		CO 2: Learn the genesis of friction, the theories/laws of sliding and rolling friction.
		CO 3: Apply the principles and design procedures for hydrostatic bearings.
		CO 4: Analyze the principles of hydrodynamic and mixed/ boundary lubrication.
		CO 5: Gain knowledge about the types of seals and failure of tribological components.
	COURSE CODE:	COURSE NAME: STATISTICAL DESIGN IN QUALITY CONTROL
10		CO 1: Interpret quality engineering in production design, Loss Function and Quality Level in production process
		CO 2: Illustrate tolerance design for N-type, L-type and S-type characteristics and tolerance allocation.
		CO 3: Interpret ANOVA techniques and need for ANOVA with multiple level factors.
		CO 4: Make use of orthogonal arrays for typical test strategies and interpolate experimental results.


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CO 5: Understand six sigma DMAIC methodology and tools for process improvement in services and small organizations

COURSE CODE:

COURSE NAME: ADVANCED COMPUTATIONAL FLUID DYNAMICS

11

CO1: Learn the principles of various flows, finite difference and finite volume methods

CO2: Learn the concepts of higher order upwind schemes for incompressible flow.

CO3: Analyze the implicit methods for incompressible flow.

CO4: Apply the concepts of compressible flow.

CO5: Model and simulate the turbulence.

COURSE CODE:

COURSE NAME: MATERIALS CHARACTERIZATION TECHNIQUES

12

CO1: Understand the various structure analysis tools

CO2: Apply microscopic techniques for material characterization.

CO3: Learn about thermal analysis techniques.

CO4: Understand magnetic characterization techniques.

CO5: Learn about optical and electronic characterization techniques.

COURSE CODE:

COURSE NAME: PRODUCT DESIGN

13

CO1: Understand the basic concepts of product design process

CO2: Identify the operations of product management and impact of manufacturing processes on product decisions.

CO3: Understand concepts of risks and reliability of the products design

CO4: Interpret the various testing procedure of the product design.

CO5: Illustrate the concepts of maintainability.

COURSE CODE:

COURSE NAME: ELECTRIC AND HYBRID VEHICLES

14

CO1: Understand electric vehicle & HEV for various applications

CO2: Have knowledge about the electric vehicle system and its parameters

CO3: Learn about EV motor drives

CO4: Understand the concepts of HEV.

CO5: Learn about the energy sources, battery chargers and charging infrastructure.

COURSE CODE:

COURSE NAME: MECHANICAL VIBRATIONS AND ACOUSTICS

15

CO1: Learn about the basic concepts and behavior of vibrations in machines

CO2: Analyze the machine vibrations in multi degree of freedom systems

CO3: Apply the torsional vibration concepts to the continuous systems

CO4: Learn about the basic concepts of acoustics.

CO5: Utilize the noise measuring instruments

COURSE CODE:

COURSE NAME: ADVANCED THERMODYNAMICS

16

CO1: Understand the thermodynamic laws and corollaries.

CO2: Illustrate the concepts of real gas behavior

CO3: Apply the general concepts of combustion reactions and chemical equilibrium of ideal gases.

CO4: Analyze power cycles.



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	CO5: Apply the working principles of direct energy conversion techniques.	
	COURSE CODE:	COURSE NAME: Design for Manufacturing and Assembly
17	CO1: Understand the basic concepts of design for manual assembly	
	CO2: Identify basic design procedure of various machining processes.	
	CO3: Illustrate the design considerations metal casting, extrusion and sheet metal work	
	CO4: Interpret the design considerations of various metal joining process.	
	CO5: Understand the basic design concepts involved in the assembly automation	
	COURSE CODE:	COURSE NAME: ROBOTICS AND CONTROL
18	CO1: Demonstrate basic concepts of motion controllers, robot actuation and feedback components	
	CO2: Interpret the sensing and Digitizing-imaging devices, image processing and analysis on image data reduction, feature extraction and Object recognition	
	CO3: Classify generations of robot programming languages, Robot language structures, their elements and function	
	CO4: Make use of AML Language	
	CO5: Explain Robot cell design and control and practical study of virtual robot	
	COURSE CODE:	COURSE NAME: TURBO MACHINES
19	CO1: Illustrate the concepts of turbo machines.	
	CO2: Analyze the thermal analysis of steam nozzles and steam turbines	
	CO3: Build the concepts of gas dynamics and centrifugal compressor	
	CO4: Build the concepts of cascade analysis and axial compressors	
	CO5: Understand the concepts axial flow gas turbines	
	COURSE CODE:	COURSE NAME: MATERIAL TECHNOLOGY
20	CO1: Learn the concepts of different strengthening mechanisms and plastic behaviour of engineering materials.	
	CO2: Learn the principles of deformation and fracture mechanism.	
	CO3: Analyze the concepts of fatigue and fracture of non-metallic materials.	
	CO4: Select the modern metallic materials for various engineering applications.	
	CO5: Gain knowledge about the non-metallic materials and applications.	



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DEPARTMENT OF MECHANICAL ENGINEERING

SUBJECTS FOR B.Tech (MINOR) in MECHANICAL ENGINEERING (R20)

S.No	COURSE CODE:	COURSE NAME:
		BASIC THERMODYNAMICS
1	CO1: Basic concepts like thermodynamic system, its boundary, related fundamental definitions and distinguish between point function and path function.	
	CO2: Energy conservation principle, concept of equality of temperature, principle of operation of various temperature measuring devices and applications of various flow systems.	
	CO3: Thermodynamics principles to heat engines & refrigerator/ heat pump and analyse the concepts of Carnot cycle, entropy, availability and irreversibility, Maxwells relations and thermodynamic functions.	
	CO4: Process of steam formation and its representation on property diagrams with various phase changes and should be able to calculate the quality of steam after its expansion in a steam turbine, with the help of standard steam tables and charts.	
	CO5: To calculate various psychrometric properties of air using psychrometric charts.	
	COURSE CODE:	COURSE NAME:MANUFACTURING PROCESSES
2	CO1: Learn about the basic concepts of casting.	
	CO2: Design the gating system for different metallic components.	
	CO3: Understand the working principles of arc and gas welding processes.	
	CO4: Understand principles of Forging, rolling, extrusion and drawing processes.	
	CO5: Illustrate the various sheet metal forming processes for a specific application.	
	COURSE CODE:	COURSE NAME:MATERIALS SCIENCE AND ENGINEERING
3	CO1: To learn the structure of metals and the necessity of alloying.	
	CO2: To learn the equilibrium diagrams and properties of alloys.	
	CO3: To learn about the ferrous alloys.	
	CO4: To learn the structure and properties of non-ferrous metals and alloys.	
	CO5: To learn the principles of heat treatment of alloys.	
	COURSE CODE:	COURSE NAME:BASIC MECHANICAL DESIGN
4	CO1: Learn the design procedure of engineering problems with constraints.	
	CO2: Measure the stress concentration and strength of machine elements.	
	CO3: Learn the principles and apply to design the riveted and welded joints.	
	CO4: Learn the design principles to design shafts and shaft couplings under different loading conditions.	
	CO5: Know about mechanical springs and apply the principles to design springs for different loading conditions.	
	COURSE CODE:	COURSE NAME:OPTIMIZATION TECHNIQUES
5	CO1: Learn the classification of optimization problems and classical optimization techniques.	
	CO2: Learn and apply unconstrained optimization techniques to solve problems.	
	CO3: Learn and apply constrained optimization techniques to solve problems.	

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CO4: Learn to obtain optimized solutions using constrained and unconstrained geometric programming
 CO5: Learn the principles of dynamic programming and its applications.

COURSE CODE: **COURSE NAME: POWER PLANT ENGINEERING**

6
 CO1: Illustrate the functions of different components of steam power plant
 CO2: Describe basic working principles, performance characteristics and components of gas turbine and diesel power plants
 CO3: Illustrate basic working principles of hydroelectric power plants and analyze the importance of hydrological cycles, measurements and drainage characteristics
 CO4: Learn about the principal components and types of nuclear reactors
 CO5: Analyze the working of power plant instrumentation and estimate the economics of power plants

COURSE CODE: **COURSE NAME: AUTOMOBILE ENGINEERING**

7
 CO1: Acquire the basic knowledge of anatomy of an automobile and realize the functions of various steering systems.
 CO2: Understand the systems of automobile transmission systems
 CO3: Understand various braking and suspension systems used in automobiles
 CO4: Acquire the knowledge of engine specifications and safety systems and its components
 CO5: Explain the systems of engine servicing and emission control systems

COURSE CODE: **COURSE NAME: INDUSTRIAL ENGINEERING AND MANAGEMENT**

8
 CO1: Learn the scientific principles of management to improve productivity.
 CO2: Gain the knowledge of financial management.
 CO3: Learn the types of plant layout and principles of statistical quality control.
 CO4: Apply the concepts of human resources management.
 CO5: Analyze project related issues and solve through project management techniques.

COURSE CODE: **COURSE NAME: PRODUCTION DESIGN AND DEVELOPMENT**

9
 CO1: Understand the basic concepts of product design process
 CO2: Identify the operations of product management and impact of manufacturing processes on product decisions
 CO3: Understand concepts of risks and reliability of the products design
 CO4: Interpret the various testing procedure of the product design.
 CO5: Illustrate the concepts of maintenance concepts and procedures of product design

COURSE CODE: **COURSE NAME: SMART MANUFACTURING**

10
 CO1: Apply the basic concepts of smart manufacturing.
 CO2: Analyze about smart machines and sensors.
 CO3: Utilize the principles of IoT connectivity to industry 4.0.
 CO4: Perceive about digital twin and its applications and machine learning and artificial intelligence in manufacturing.
 CO5: Learn the basic concepts of metaverse.

	COURSE CODE:	COURSE NAME: MECHANICAL MEASUREMENTS
11	CO 1: Learn the principles of measurement systems and measurement of displacement.	
	CO 2: Learn the measurement concepts of temperature and pressure.	
	CO 3: Apply the concepts of measurement of level and the measurement of flow and speed.	
	CO 4: Learn the concepts of measurement of stress and strain.	
	CO 5: Apply the concepts in measuring the humidity, force, torque and power.	
	COURSE CODE:	COURSE NAME: INDUSTRIAL ROBOTICS
12	CO 1: Discuss various applications and components of industrial robot systems.	
	CO 2: Learn about the types of actuators used in robotics.	
	CO 3: Calculate the forward kinematics and inverse kinematics.	
	CO 4: Learn about programming principles and languages for a robot control system.	
	CO 5: Discuss the applications of image processing and machine vision in robotics.	
	COURSE CODE:	COURSE NAME: MECHATRONICS
13	CO 1: Understand the use the various mechatronics systems, measurement systems, sensors and transducers.	
	CO 2: Apply the concepts of solid state electronic devices.	
	CO 3: Identify the components in the design of electro mechanical systems.	
	CO 4: Apply the concepts of digital electronics and applications of PLCs for control.	
	CO 5: Understand system interfacing, data acquisition and design of mechatronics systems.	


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ESTABLISHED IN THE YEAR 1983



COLLEGE CODE
VSPT

A.Y. 2022-23

YEAR:II B.Tech

SEMESTER:I

S.NO:	COURSE CODE	COURSE
1.	Course code:R2021011	Course: Mathematics-III
	COs:1	Estimate the work done against a field, circulation and flux using vector calculus
	COs:2	Apply the Laplace transform for solving differential equations
	COs:3	Find or compute the Fourier series of periodic signals
	COs:4	Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms
	COs:5	Identify solution methods for partial differential equations that model physical processes
2,	Course code:R2021052	Course: OPERATING SYSTEMS
	COs:1	Describe various generations of Operating System and functions of Operating System
	COs:2	Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
	COs:3	Solve Inter Process Communication problems using Mathematical Equations by various methods
	COs:4	Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques
	COs:5	Outline File Systems in Operating System like UNIX/Linux and Windows
3,	Course code:R2021053	Course : Software engineering
	COs:1	Ability to transform an Object-Oriented Design into high quality, executable code
	COs:2	Skills to design, implement, and execute test cases
	COs:3	Skill to design the Unit and Integration level
	COs:4	Compare conventional and agile software methods

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	COs:5	Analyze the software architecture
4.	Course code:R2021051	Course: OBJECT ORIENTED PROGRAMMING THROUGH C++
	COs:1	Classify object oriented programming and procedural programming
	COs:2	Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling
	COs:3	Build C++ classes using appropriate encapsulation and design principles
	COs:4	Apply object oriented or non-object oriented techniques to solve bigger computing problems
	COs:5	Analyze the Overview of Standard Template Library
5.	Course code:R2021054	Course: Mathematical foundations of computer science
	COs:1	Demonstrate skills in solving mathematical problems
	COs:2	Comprehend mathematical principles and logic
	COs:3	Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
	COs:4	Manipulate and analyze data numerically and/or graphically using appropriate Software
	COs:5	Communicate effectively mathematical ideas/results verbally or in writing
6.	Course code: R2021055	Course: OBJECT ORIENTED PROGRAMMING THROUGH C++ LAB
	COs:1	Apply the various OOPs concepts with the help of programs.
7.	Course code: R2021056	Course: OPERATING SYSTEM LAB
	COs:1	To use Unix utilities and perform basic shell control of the utilities
	COs:2	To use the Unix file system and file access control
	COs:3	To use of an operating system to develop software
	COs:4	Students will be able to use Linux environment efficiently
	COs:5	Solve problems using bash for shell scripting
8.	Course code: R2021057	Course: SOFTWARE ENGINEERING LAB
	COs:1	By the end of this lab the student is able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project

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	COs:2	prepare SRS document, design document, test cases and software configuration management and risk management related document
	COs:3	develop function oriented and object oriented software design using tools like rational rose.
	COs:4	use modern engineering tools necessary for software project management, estimations, time management and software reuse
	COs:5	generate test cases for software testing
9.	Course code: R2021058	Course: APPLICATIONS OF PYTHON-NumPy
	COs:1	Explain how data is collected, managed and stored for processing
	COs:2	Understand the workings of various numerical techniques, different descriptive measures of Statistics, correlation and regression to solve the engineering problems
	COs:3	Use NumPy perform common data wrangling and computational tasks in Python.
	COs:4	Understand how to apply some linear algebra operations to n-dimensional arrays
10.	Course code: R202105A	Course: WEB APPLICATION DEVELOPMENT USING FULL STACK
	COs:1	Analyze a web page and identify its elements and attributes.
	COs:2	Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Style sheet
	COs:3	Implement MVC and responsive design to scale well across PC, tablet and Mobile Phone
	COs:4	Create web pages using HTML and Cascading Style Sheets.
11.	Course code: R2021010	Course: CONSTITUTION OF INDIA
	COs:1	Understand historical background of the constitution making and its importance for building a democratic India.
	COs:2	Understand the functioning of three wings of the government i.e., executive, legislative and judiciary.
	COs:3	Understand the value of the fundamental rights and duties for becoming good citizen of India
	COs:4	Analyze the decentralization of power between central, state and local self-government.
	COs:5	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.


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VIZIANAGARAM ENGINEERING COLLEGE




COLLEGE CODE
VSPT

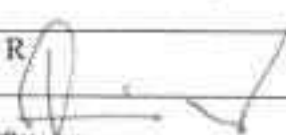
12.	Course code: R2022051	Course: PROBABILITY AND STATISTICS
	COs:1	Classify the concepts of data science and its importance
	COs:2	Interpret the association of characteristics and through correlation and regression tools
	COs:3	Apply discrete and continuous probability distributions
	COs:4	Design the components of a classical hypothesis test
	COs:5	Infer the statistical inferential methods based on small and large sampling test
13.	Course code: R2022055	Course: MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY
	COs:1	The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product
	COs:2	The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs
	COs:3	The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units
	COs:4	The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis
	COs:5	The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making
14.	Course code: R2022052	Course: DATABASE MANAGEMENT SYSTEMS
	COs:1	Describe a relational database and object-oriented database
	COs:2	Create, maintain and manipulate a relational database using SQL
	COs:3	Describe ER model and normalization for database design
	COs:4	Examine issues in data storage and query processing and can formulate appropriate solutions

YEAR:II B.Tech

SEMESTER:II


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	COs:5	Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage
15.	Course code: R2022054	Course: JAVA PROGRAMMING
	COs:1	Able to realize the concept of Object Oriented Programming & Java Programming Constructs
	COs:2	Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
	COs:3	Apply the concept of exception handling and Input/ Output operations
	COs:4	Able to design the applications of Java & Java applet
	COs:5	Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit
16.	Course code: R2022053	Course: FORMAL LANGUAGES AND AUTOMATA THEORY
	COs:1	Classify machines by their power to recognize languages
	COs:2	Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy
	COs:3	Employ finite state machines to solve problems in computing
	COs:4	Illustrate deterministic and non-deterministic machines
	COs:5	Quote the hierarchy of problems arising in the computer science
17.	Course code: R2022056	Course: DATABASE MANAGEMENT SYSTEMS LAB
	COs:1	Utilize SQL to execute queries for creating database and performing data manipulation operations
	COs:2	Examine integrity constraints to build efficient databases
	COs:3	Apply Queries using Advanced Concepts of SQL
	COs:4	Build PL/SQL programs including stored procedures, functions, cursors and triggers
18.	Course code: R2022057	Course: R PROGRAMMING LAB
	COs:1	Access online resources for R and import new function packages into the R workspace
	COs:2	Import, review, manipulate and summarize data-sets in R
	COs:3	Explore data-sets to create testable hypotheses and identify appropriate statistical tests
	COs:4	Perform appropriate statistical tests using R


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	COs:5	Create and edit visualizations with R
19.	Course code: R2022058	Course: JAVA PROGRAMMING LAB
	COs:1	Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings
	COs:2	Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
	COs:3	Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism
	COs:4	Construct Threads, Event Handling, implement packages, developing applets
20.	Course code: R2022059	Course: APPLICATIONS OF PYTHON-Pandas
	COs:1	Use Pandas to create and manipulate data structures like Series and DataFrames.
	COs:2	Work with arrays, queries, and dataframes
	COs:3	Query DataFrame structures for cleaning and processing and manipulating files
	COs:4	Understand best practices for creating basic charts
21.	Course code: R202205A	Course: Web Application Development Using Full Stack
	COs:1	develop of the major Web application tier- Client side development
	COs:2	participate in the active development of cross-browser applications through JavaScript
	COs:3	Develop JavaScript applications that transition between state

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YEAR:III B.Tech

SEMESTER:I

22.	Course code: R2031051	Course: COMPUTER NETWORKS
	COs:1	Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards.
	COs:2	Discuss different transmission media and different switching networks.
	COs:3	Analyze data link layer services, functions and protocols like HDLC and PPP
	COs:4	Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols
	COs:5	Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.
23.	Course code: R2031052	Course: DESIGN AND ANALYSIS OF ALGORITHMS
	COs:1	Analyze the performance of a given algorithm, denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
	COs:2	List and describe various algorithmic approaches and Solve problems using divide and conquer & greedy Method
	COs:3	Synthesize efficient algorithms dynamic programming approaches to solve in common engineering design situations.
	COs:4	Organize important algorithmic design paradigms and methods of analysis: backtracking, branch and bound algorithmic approaches
	COs:5	Demonstrate NP- Completeness theory, lower bound theory and String Matching
24.	Course code: R2031053	Course: DATA WAREHOUSING AND DATA MINING
	COs:1	Illustrate the importance of Data Warehousing, Data Mining and its functionalities and Design schema for real time data warehousing applications
	COs:2	Demonstrate on various Data Preprocessing Techniques viz. data cleaning, data integration, data transformation and data reduction and Process raw data to make it suitable for various data mining algorithms.
	COs:3	Choose appropriate classification technique to perform classification, model building and evaluation.

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	COs:4	Make use of association rule mining techniques viz. Apriori and FP Growth algorithms and analyze on frequent itemsets generation
	COs:5	Identify and apply various clustering algorithm (with open source tools), interpret, evaluate and report the result
25.	Course code: R203105B	Course: SOFTWARE PROJECT MANAGEMENT (Professional Elective –I)
	COs:1	Apply the process to be followed in the software development life-cycle models
	COs:2	Apply the concepts of project management & planning
	COs:3	Implement the project plans through managing people, communications and change
	COs:4	Conduct activities necessary to successfully complete and close the Software projects
	COs:5	Implement communication, modeling, and construction & deployment practices in software development
26.	Course code: R203102F	Course: RENEWABLE ENERGY SOURCES(Open Elective-1)
	COs:1	Able to understand the renewable energy sources available at present.
	COs:2	Able to understand the solar energy operation and its characteristics.
	COs:3	To educate the wind energy operation and its types
	COs:4	To educate the tidal and geothermal energy principles and its operation.
	COs:5	Able to understand the biomass energy generation and its technologies.
27.	Course code: R203105A	Course: ARTIFICIAL INTELLIGENCE (Professional Elective –I)
	COs:1	Understand the fundamental concepts in Artificial Intelligence
	COs:2	Analyze the applications of search strategies and problem reductions
	COs:3	Apply the mathematical logic concepts.
	COs:4	Develop the Knowledge representations in Artificial Intelligence.
	COs:5	Explain the Fuzzy logic systems.
28.	Course code: R203105C	Course: DISTRIBUTED SYSTEMS (Professional Elective –I)
	COs:1	Elucidate the foundations and issues of distributed systems
	COs:2	Illustrate the various synchronization issues and global state for distributed systems
	COs:3	Describe the agreement protocols and fault tolerance mechanisms in distributed systems
	COs:4	Illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems

	COs:5	Describe the features of peer-to-peer and distributed shared memory systems
29.	Course code: R203105D	Course: ADVANCED UNIX PROGRAMMING (Professional Elective -I)
	COs:1	Gain good knowledge on Unix commands and awareness of shell programming
	COs:2	Know about different system calls for files and directories
	COs:3	Ability to know the working of processes and signals
	COs:4	Application of client server program for IPC
	COs:5	Knowledge about socket programming
30.	Course code: R2031054	Course: DATA WAREHOUSING AND DATA MINING LAB
	COs:1	Design a data mart or data warehouse for any organization
	COs:2	Extract knowledge using data mining techniques and enlist various algorithms used in information analysis of Data Mining Techniques
	COs:3	Demonstrate the working of algorithms for data mining tasks such as association rule mining, classification for realistic data
	COs:4	Implement and Analyze on knowledge flow application on data sets and Apply the suitable visualization techniques to output analytical results
31.	Course code: R2031055	Course: COMPUTER NETWORKS LAB
	COs:1	Know how reliable data communication is achieved through data link layer.
	COs:2	Suggest appropriate routing algorithm for the network.
	COs:3	Provide internet connection to the system and its installation.
	COs:4	Work on various network management tools.
32.	Course code: R2031056	Course: ANIMATION COURSE: ANIMATION DESIGN
	COs:1	learn various tools of digital 2-D animation
	COs:2	understand production pipeline to create 2-D animation.
	COs:3	apply the tools to create 2D animation for films and videos
	COs:4	understand different styles and treatment of content in 3D model creation
	COs:5	apply tools to create effective 3D modelling texturing and lighting.
33.	Course code: R203105A	Course: CONTINUOUS INTEGRATION AND CONTINUOUS DELIVERY USING DevOps (Skill Oriented Course)

	COs:1	Understand the why, what and how of DevOps adoption
	COs:2	Attain literacy on Devops
	COs:3	Align capabilities required in the team
	COs:4	Create an automated CICD pipeline using a stack of tools
34.	Course code: R2031058	Course: EMPLOYABILITY SKILLS-I
	COs:1	Understand the corporate etiquette.
	COs:2	Make presentations effectively with appropriate body language
	COs:3	Be composed with positive attitude
	COs:4	Understand the core competencies to succeed in professional and personal life


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COLLEGE CODE
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YEAR:III B.Tech

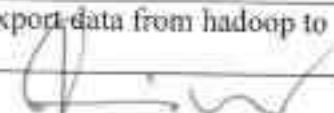
SEMESTER:II

35.	Course code: R2032051	Course: MACHINE LEARNING
	COs:1	Explain the fundamental usage of the concept Machine Learning system
	COs:2	Demonstrate on various regression Technique
	COs:3	Analyze the Ensemble Learning Methods
	COs:4	Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.
	COs:5	Discuss the Neural Network Models and Fundamentals concepts of Deep Learning
36.	Course code: R2032052	Course: COMPILER DESIGN
	COs:1	Demonstrate phases in the design of compiler
	COs:2	Organize Syntax Analysis, Top Down and grammars
	COs:3	Design Bottom Up Parsing and Construction of LR parsers
	COs:4	Analyze synthesized, inherited attributes and syntax directed translation schemes
	COs:5	Determine algorithms to generate code for a target machine
37.	Course code: R2032053	Course: CRYPTOGRAPHY AND NETWORK SECURITY
	COs:1	Explain different security threats and countermeasures and foundation course of cryptography mathematics.
	COs:2	Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography
	COs:3	Revise the basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms such as RSA, ECC and some more
	COs:4	Design applications of hash algorithms, digital signatures and key management techniques
	COs:5	Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL, TLS, and IPsec
38.	Course code: R203205A	Course: MOBILE COMPUTING (Professional Elective-II)

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	COs:1	Develop a strong grounding in the fundamentals of mobile Networks
	COs:2	Apply knowledge in MAC, Network, and Transport Layer protocols of Wireless Network
	COs:3	Comprehend, design, and develop a lightweight network stack
	COs:4	Analyze the Mobile Network Layer system working
	COs:5	Explain about the WAP Model
39.	Course code: R203205B	Course: BIG DATA ANALYTICS (Professional Elective II)
	COs:1	Illustrate big data challenges in different domains including social media, transportation, finance and medicine
	COs:2	Use various techniques for mining data stream
	COs:3	Design and develop Hadoop
	COs:4	Identify the characteristics of datasets and compare the trivial data and big data for various applications
	COs:5	Explore the various search methods and visualization techniques
40.	Course code: R203205C	Course: OBJECT ORIENTED ANALYSIS AND DESIGN (Professional Elective II)
	COs:1	Analyze the nature of complex system and its solutions.
	COs:2	Illustrate & relate the conceptual model of the UML, identify & design the classes and relationships
	COs:3	Analyze & Design Class and Object Diagrams that represent Static Aspects of a Software System and apply basic and Advanced Structural Modeling Concepts for designing real time applications.
	COs:4	Analyze & Design behavioral aspects of a Software System using Use Case, Interaction and Activity Diagrams.
	COs:5	Analyze & Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspects and Runtime environment of Software Systems.
41.	Course code: R203205D	Course: NETWORK PROGRAMMING (Professional Elective II)
	COs:1	Identifying different models and sockets
	COs:2	Demonstrate different TCP Echo server functions and I/O models
	COs:3	Rationalize IPV4 and IPV6 Socket options
	COs:4	Identifying daemon processing and Advanced input and output functions
	COs:5	Analyze Broadcasting and multicasting
42.	Course code: R203205E	Course: MEAN STACK DEVELOPMENT (Job Oriented Course)
	COs:1	Build static web pages using HTML 5 elements

	COs:2	Apply JavaScript to embed programming interface for web pages and also to perform Client side validations.
	COs:3	Build a basic web server using Node.js, work with Node Package Manager (NPM) and recognize the need for Express.js
	COs:4	Develop JavaScript applications using typescript and work with document database using Mongo DB.
	COs:5	Utilize Angular JS to design dynamic and responsive web pages.
43.	Course code: R2032054	Course: MACHINE LEARNING USING PYTHON LAB
	COs:1	Implement procedures for the machine learning algorithms
	COs:2	Design and Develop Python programs for various Learning algorithms
	COs:3	Apply appropriate data sets to the Machine Learning algorithms
	COs:4	Develop Machine Learning algorithms to solve real world problems
44.	Course code: R2032055	Course: COMPILER DESIGN LAB
	COs:1	Design simple lexical analyzers
	COs:2	Determine predictive parsing table for a CFG
	COs:3	Examine LR parser and generating SLR Parsing table
	COs:4	Relate Intermediate code generation for subset C language
	COs:5	Apply Lex and Yacc tools
45.	Course code: R2032056	Course: CRYPTOGRAPHY NETWORK SECURITY LAB
	COs:1	Apply the knowledge of symmetric cryptography to implement encryption and decryption using Caesar Cipher, Substitution Cipher, Hill Cipher
	COs:2	Demonstrate the different algorithms like DES, BlowFish, and Rijndael, encrypt the text "Hello world" using Blowfish Algorithm.
	COs:3	Analyze and implement public key algorithms like RSA, Diffie-Hellman Key Exchange mechanism, the message digest of a text using the SHA-1 algorithm
46.	Course code: R203205A	Course: BIG DATA: SPARK (Skill Oriented Course)
	COs:1	Develop MapReduce Programs to analyze large dataset Using Hadoop and Spark.
	COs:2	Write Hive queries to analyze large dataset Outline the Spark Ecosystem and its components
	COs:3	Perform the filter, count, distinct, map, flatMap RDD Operations in Spark.
	COs:4	Build Queries using Spark SQL.
	COs:5	Make use of sqoop to import and export data from hadoop to database and vice-versa


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	COs:6	Apply Spark Joins on Sample Data Sets
47.	Course code: R2032058	Course: MEAN STACK TECHNOLOGIES-MODULE I (HTML 5, JAVASCRIPT, EXPRESS.JS, NODE.JS AND TYPESCRIPT) (Skill Oriented Course)
	COs:1	Develop professional web pages of an application using HTML elements-like lists, navigations, tables, various form elements, embedded media which includes images, audio, video and CSS Styles.
	COs:2	Utilize JavaScript for developing interactive HTML web pages and validate form data.
	COs:3	Build a basic web server using Node.js and also working with Node Package Manager (NPM).
	COs:4	Build a web server using Express.js
	COs:5	Make use of Typescript to optimize JavaScript code by using the concept of strict type checking.
48.	Course code: R2032059	Course: EMPLOYABILITY SKILLS-II
	COs:1	Solve various Basic Mathematics problems by following different methods .
	COs:2	Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems
	COs:3	Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.
	COs:4	Analyze, summarize and present information in quantitative forms including table, graphs and formulas


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COLLEGE CODE
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YEAR:IV B.Tech

SEMESTER:I

49.	Course code: R1941053	Course: MACHINE LEARNING
	COs:1	Identify machine learning techniques suitable for a given problem
	COs:2	Solve the problems using various machine learning techniques
	COs:3	Apply Dimensionality reduction techniques
	COs:4	Design application using machine learning techniques
50.	Course code: R1941051	Course: CRYPTOGRAPHY AND NETWORK SECURITY
	COs:1	Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory
	COs:2	Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication
	COs:3	Apply different digital signature algorithms to achieve authentication and create secure applications
	COs:4	Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPsec, and PGP
	COs:5	Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications
	COs:6	Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.
51.	Course code: R1941052	Course: UML & DESIGN PATTERNS
	COs:1	Illustrate software design with UML diagrams
	COs:2	Design software applications using OO concepts
	COs:3	Identify various scenarios based on software requirements
	COs:4	Apply UML based software design into pattern based design using design patterns
	COs:5	Illustrate the various testing methodologies for OO software
52.	Course code: R1941054A	Course: MOBILE COMPUTING(Professional Elective- III)
	COs:1	Interpret Wireless local area networks (WLAN): MAC design principles, 802.11 WIFI

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	COs:2	Discuss fundamental challenges in mobile communications and potential Techniques in GSM
	COs:3	Demonstrate Mobile IP in Network layer
	COs:4	Elaborate TCP/IP Protocols and database issues
	COs:5	Illustrate different data delivery methods and synchronization protocols
	COs:6	Develop applications that are mobile-device specific and demonstrate current Practice in mobile computing contexts
53.	Course code: R1941054B	Course: DATA SCIENCE(Professional Elective- III)
	COs:1	Describe what Data Science is and the skill sets needed to be a data scientist
	COs:2	Illustrate in basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modelling. Fit a model to data
	COs:3	Use R to carry out basic statistical modeling and analysis
	COs:4	Apply basic tools (plots, graphs, summary statistics) to carry out EDA
	COs:5	Describe the Data Science Process and how its components interact
	COs:6	Use APIs and other tools to scrap the Web and collect data • Apply EDA and the Data Science process in a case study
54.	Course code: R1941054C	Course: NoSQL DATABASES(Professional Elective- III)
	COs:1	Identify what type of NoSQL database to implement based on business requirements (key-value, document, full text, graph, etc.)
	COs:2	Apply NoSQL data modeling from application specific queries
	COs:3	Use Atomic Aggregates and denormalization as data modelling techniques to optimize query processing
55.	Course code: R1941054D	Course: INTERNET OF THINGS(Professional Elective- III)
	COs:1	Describe the usage of the term 'the internet of things' in different contexts
	COs:2	Discover the various network protocols used in IoT and familiar with the key wireless technologies used in IoT systems, such as Wi-Fi, 6LoWPAN, Bluetooth and ZigBee
	COs:3	Define the role of big data, cloud computing and data analytics in a typical IoT system Design a simple IoT system made up of sensors, wireless network connection, data analytics and display/actuators, and write the necessary control software
	COs:4	Build and test a complete working IoT system
56.	Course code: R1941054E	Course: SOFTWARE PROJECT MANAGEMENT
	COs:1	Apply the process to be followed in the software development life-cycle models
	COs:2	Apply the concepts of project management & planning

	COs:3	Implement the project plans through managing people, communications and change
	COs:4	Conduct activities necessary to successfully complete and close the Software projects
	COs:5	Implement communication, modeling, and construction & deployment practices in software development
57.	Course code: R1941055A	Course: WEB SERVICES(Professional Elective- IV)
	COs:1	Recite the advantages of using XML technology family
	COs:2	Analyze the problems associated with tightly coupled distributed software architecture
	COs:3	Learn the Web services building block
	COs:4	Implement e-business solutions using XML based web services
58.	Course code: R1941055B	Course: CLOUD COMPUTING(Professional Elective- IV)
	COs:1	Interpret the key dimensions of the challenge of Cloud Computing
	COs:2	Examine the economics, financial, and technological implications for selecting cloud computing for own organization
	COs:3	Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications
	COs:4	Evaluate own organizations' needs for capacity building and training in cloud computing-related IT areas
	COs:5	Illustrate Virtualization for Data-Center Automation
59.	Course code: R1941055C	Course: MEAN STACK TECHNOLOGIES(Professional Elective- IV)
	COs:1	Enumerate the Basic Concepts of Web & Markup Languages
	COs:2	Develop web Applications using Scripting Languages & Frameworks
	COs:3	Make use of Express JS and Node JS frameworks
	COs:4	Illustrate the uses of web services concepts like restful, react js
	COs:5	Apply Deployment Techniques & Working with cloud platform
60.	Course code: R1941055D	Course: AD-HOC AND SENSOR NETWORKS(Professional Elective- IV)
	COs:1	Evaluate the principles and characteristics of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks
	COs:2	Determine the principles and characteristics of wireless sensor networks
	COs:3	Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc sensor networks

	COs:4	Illustrate the various sensor network Platforms, tools and applications
	COs:5	Demonstrate the issues and challenges in security provisioning and also familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs
61.	Course code: R1941055E	Course: CYBER SECURITY & FORENSICS(Professional Elective- IV)
	COs:1	Enumerate the computer forensics fundamentals
	COs:2	Describe the types of computer forensics technology
	COs:3	Analyze various computer forensics systems
	COs:4	Illustrate the methods for data recovery, evidence collection and data seizure
	COs:5	Identify the Role of CERT-In Security
62.	Course code: R1941057	Course: UML LAB
	COs:1	Know the syntax of different UML diagrams
	COs:2	Create use case documents that capture requirements for a software system
	COs:3	Create class diagrams that model both the domain model and design model of a software system
	COs:4	Create interaction diagrams that model the dynamic aspects of a software system
	COs:5	Write code that builds a software system
	COs:6	Develop simple applications
63.	Course code: R1941059	Course: IPR & PATENTS
	COs:1	IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents.
	COs:2	Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements


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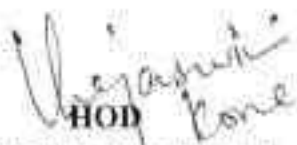
SEMESTER:II

64.	Course code: R1942051	Course: MANAGEMENT AND ORGANIZATIONAL BEHAVIOR
	COs:1	After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational structure
	COs:2	Will familiarize with the concepts of functional management that is HRM and Marketing of new product developments
	COs:3	The learner is able to think in strategically through contemporary management practices
	COs:4	The learner can develop positive attitude through personality development and can equip with motivational theories
	COs:5	The student can attain the group performance and grievance handling in managing the organizational culture
65.	Course code: R194205A	Course: DEEP LEARNING
	COs:1	Demonstrate the mathematical foundation of neural network
	COs:2	Describe the machine learning basics
	COs:3	Differentiate architecture of deep neural network
	COs:4	Build a convolutional neural network
	COs:5	Build and train RNN and LSTMs
66.	Course code: R194205B	Course: QUANTUM COMPUTING
	COs:1	Analyze the behaviour of basic quantum algorithms
	COs:2	Implement simple quantum algorithms and information channels in the quantum circuit model
	COs:3	Simulate a simple quantum error-correcting code
	COs:4	Prove basic facts about quantum information channels
67.	Course code: R194205C	Course: DevOps
	COs:1	Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility
	COs:2	Describe DevOps & DevSecOps methodologies and their key concepts

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	COs:3	Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
	COs:4	Set up complete private infrastructure using version control systems and CI/CD tools.
68.	Course code: R194205D	Course: BLOCKCHAIN TECHNOLOGIES
	COs:1	Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding.
	COs:2	Identify the risks involved in building Block chain applications.
	COs:3	Review of legal implications using smart contracts.
	COs:4	Choose the present landscape of Blockchain implementations and Understand Crypto currency markets
	COs:5	Examine how to profit from trading crypto currencies.
69.	Course code: R194205E	Course: BIG DATA ANALYTICS
	COs:1	Illustrate big data challenges in different domains including social media, transportation, finance and medicine
	COs:2	Use various techniques for mining data stream
	COs:3	Design and develop Hadoop
	COs:4	Identify the characteristics of datasets and compare the trivial data and big data for various applications
	COs:5	Explore the various search methods and visualization techniques
70.	Course code: (R194204F)	Course: IMAGE PROCESSING--Open Elective III (Offered by CSE to other departments)
	COs:1	Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.
	COs:2	Operate on images using the techniques of smoothing, sharpening and enhancement.
	COs:3	Use the restoration concepts and filtering techniques
	COs:4	Illustrate the basics of segmentation
71.	Course code: (R194204G)	Course: MOBILE APPLICATION DEVELOPMENT--Open Elective III (Offered by CSE to other departments)
	COs:1	Install and configure Android application development tools.
	COs:2	Design and develop user Interfaces for the Android platform.
	COs:3	Use state information across important operating system events.
	COs:4	Apply Java programming concepts to Android application development.
72.	Course code: (R194204H)	Course: CYBER SECURITY--Open Elective III (Offered by CSE to other departments)

	COs:1	Illustrate the broad set of technical, social & political aspects of Cyber Security and security management methods to maintain security protection.
	COs:2	Appreciate the vulnerabilities and threats posed by criminals, terrorist and nation states to national infrastructure.
	COs:3	Illustrate the nature of secure software development and operating systems
	COs:4	Demonstrate the role security management plays in cyber security defense and legal and social issues at play in developing solutions
73.		PROJECT-II


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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

YEAR: IInd B.Tech

SEMESTER: 1ST

S.NO	COURSE CODE : R2021011	COURSE NAME: MATHEMATICS-III
1	<p>CO1: Interpret the physical meaning of different operators such as gradient, curl and divergence CO2: Estimate the work done against a field, circulation and flux using vector calculus CO3: Apply the Laplace transform for solving differential equations CO4: Find or compute the Fourier series of periodic signals CO5: Know and be able to apply integral expressions for the forwards and inverse Fourier transform to arrange of non-periodic wave forms CO6: Identify solution methods for partial differential equations that model physical processes</p>	
	COURSE CODE : R2021041	COURSE NAME: ELECTRONIC DEVICES AND CIRCUITS
2	<p>CO1: Apply the basic concepts of semiconductor physics. CO2: Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation. CO3: Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons. CO4: Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations. CO5: Know the need of transistor biasing, various biasing techniques for BJT and CO6: FET and stabilization concepts with necessary expressions. CO7: Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations</p>	
	COURSE CODE : R2021042	COURSE NAME: SWITCHING THEORY AND LOGIC DESIGN
3	<p>CO1: Classify different number systems and apply to generate various codes. CO2: Use the concept of Boolean algebra in minimization of switching functions CO3: Design different types of combinational logic circuits. CO4: Apply knowledge of flip-flops in designing of Registers and counters CO5: The operation and design methodology for synchronous sequential Circuits and algorithmic state machines. CO6: Produce innovative designs by modifying the traditional design techniques.</p>	
	COURSE CODE : R2021043	COURSE NAME: SIGNALS AND SYSTEMS
4	<p>CO1: Differentiate the various classifications of signals and systems CO2: Analyze the frequency domain representation of signals using Fourier concepts CO3: Classify the systems based on their properties and determine the response of LTI Systems. CO4: Know the sampling process and various types of sampling techniques. CO5: Apply Laplace and z-transforms to analyze signals and Systems (continuous & discrete).</p>	

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	COURSE CODE : R2021044	COURSE NAME: RANDOM VARIABLES AND STOCHASTIC PROCESSES
5	<p>CO1: Mathematically model their and phenomena and solve simple probabilistic problems. CO2: Identify different types of random variables and compute statistical averages of the Sarandon variables. CO3: Characterize the random processes in the time and frequency domains. CO4: Analyze the LTI systems with random inputs.</p>	
	COURSE CODE : R2021045	COURSE NAME: OOPS THROUGH JAVA LAB
6	<p>CO1: Identify classes, objects, members of a class and the relationship Among them needed for a specific problem CO2: Implement programs to distinguish different forms of inheritance CO3: Create packages and to reuse them CO4: Develop programs using Exception Handling mechanism CO5: Develop multithreaded application using synchronization concept. CO6: Design GUI based applications using Swings and AWT.</p>	
	COURSE CODE : R2021046	COURSE NAME: ELECTRONIC DEVICES AND CIRCUITS LAB
7	<p>CO1: Learn the characteristics of basic electronic devices. CO2: Learn the Characteristics of UJT. CO3: Learn the Characteristics of FET CO4: Learn about Power amplifiers. CO5: Learn about Differential amplifiers CO6: To understand the concepts of simulation by using Spice tool</p>	
	COURSE CODE : R2021047	COURSE NAME: SWITCHING THEORY AND LOGIC DESIGN LAB
8	<p>CO1: Students will be aware of theory of Boolean algebra & the underlying features of various number systems. CO2: Students will be able to use the concepts of Boolean algebra for the analysis & design of various combinational & sequential logic circuits. CO3: Students will be able to design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays.</p>	
	COURSE CODE : R2021048	COURSE NAME: PYTHON LAB (SKILL ORIENTED COURSE)
9	<p>CO1: Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements. CO2: Express proficiency in the handling of strings and functions. CO3: Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets. CO4: Identify the commonly used operations involving file systems and regular expressions. CO5: Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python.</p>	

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

YEAR: IInd B.TECH

SEMESTER: IInd

S.NO	COURSE CODE : R2022041	COURSE NAME: ELECTRONIC CIRCUIT ANALYSIS
1	CO1: Design and analysis of small signal high frequency transistor amplifier using BJT and FET. CO2: Design and analysis of multistage amplifiers using BJT and FET and Differential Amplifier using BJT. CO3: Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept. CO4: Know the classification of the power and tuned amplifiers and their analysis with performance comparison.	
	COURSE CODE : R2022042	COURSE NAME: DIGITAL IC DESIGN
2	CO1: Understand the structure of commercially available digital (integrated circuit) families. CO2: Learn the IEEE Standard 1076 Hardware Description Language (VHDL). CO3: Model complex digital systems at several levels of abstractions, behavioural, structural, and rapid system prototyping. CO4: Analyze and design basic digital circuits with combinatorial and sequential logic circuits using VHDL.	
	COURSE CODE : R2022043	COURSE NAME: ANALOG COMMUNICATIONS
3	CO1: Differentiate various Analog modulation and demodulation schemes and their spectral characteristics. CO2: Analyze noise characteristics of various analog modulation methods. CO3: Analyze various functional blocks of radio transmitters and receivers. CO4: Design simple analog systems for various modulation techniques.	
	COURSE CODE : R2022044	COURSE NAME: LINEAR CONTROL SYSTEMS
4	CO1: This course introduces the concepts of feedback and its advantages to various control systems. CO2: The performance metrics to design the control system in time-domain and frequency domains are introduced. CO3: Control systems for various applications can be designed using time-domain and frequency domain analysis. CO4: In addition to the conventional approach, the state space approach for the analysis of Control systems are also introduced.	
	COURSE CODE : R2022045	COURSE NAME: MANAGEMENT AND ORGANISATIONAL BEHAVIOUR
5	CO1: After completion of the Course the student will acquire the knowledge on management Functions, global leadership and organizational structure. CO2: Will familiarize with the concepts of functional management that is HRM and Marketing Of new product developments. CO3: The learner is able to think in strategically through contemporary management practices. CO4: The learner can develop positive attitude through personality development and can equip With motivational theories. CO5: The student can attain the group performance and grievance handling in managing the Organizational culture.	
	COURSE CODE : R2022046	COURSE NAME: ELECTRONIC CIRCUIT ANALYSIS LAB
6	CO1: Design different types of Amplifier and Oscillator circuits. CO2: Simulate different types of Amplifier and Oscillator circuits using software tool. CO3: Test different types of Amplifiers and Oscillator circuits using hardware.	
	COURSE CODE : R2022048	COURSE NAME: DIGITAL IC DESIGN LAB
7	CO1: Write a VHDL programming. CO2: Synthesize VHDL onto hardware using Xilinx tools.	

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	COURSE CODE : R2022047	COURSE NAME: ANALOG COMMUNICATION LAB
8	<p>CO1: Acquire knowledge on MATLAB or any other simulation programming skills to simulate analog and pulse modulation and demodulation techniques</p> <p>CO2: Understand the operations of analog and pulse modulation & demodulation techniques</p> <p>CO3: Exposed to various aspects of analog and pulse communications viz. modulation & demodulation techniques, sampling theorem verification and study of spectrum analyzer, frequency synthesizer, AGC & PLL.</p> <p>CO4: Design of communication circuits such as AM, SSB-SC, DSB-SC, FM, PAM, PWM & PPM.</p>	



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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

YEAR: IIIRDB.TECH

SEMESTER : IST

SL NO	COURSE CODE: R2031041	COURSE NAME: ANALOG IC'S AND APPLICATIONS
1	CO1: Describe the Op-Amp and internal Circuitry 555 Timer, PLL CO2: Discuss the Applications of Operational amplifier 555 Timer, PLL CO3: Design the Active filters using Operational Amplifier CO4: Use the Op-Amp in A to D & D to A Converters CO5: To analyse the design and working of operational amplifier	
SL NO	COURSE CODE: R2031042	COURSE NAME: ELECTROMAGNETIC WAVES AND TRANSMISSION LINES
2	CO1: Determine E and H using various laws and applications of electric & magnetic fields CO2: Apply the Maxwell equations to analyze the time varying behaviour of EM waves CO3: Gain the knowledge in uniform plane wave concept and characteristics of uniform plane wave in various media CO4: Calculate Brewster angle, critical angle and total internal reflection CO5: Derive and Calculate the expressions for input impedance of transmission lines, reflection coefficient, VSWR etc. using smith chart	
SL NO	COURSE CODE: R2031043	COURSENAME: DIGITAL COMMUNICATIONS
3	CO1: Analyze the performance of a Digital Communication System for probability of error and are able to design a digital communication system. CO2. Analyze various source coding techniques. CO3. Compute and analyze Block codes, cyclic codes and convolution codes. CO4. Design a coded communication system CO5: analyze the performance of pass band and digital communication system.	

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SL NO	COURSE CODE: PE1	COURSE NAME: ANTENNA AND WAVE PROPAGATION
4	CO1: Identify basic antenna parameters. CO2: Design and analyse wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and micro-strip antennas CO3: Quantify the fields radiated by various types of antennas CO4: Design and analyse antenna arrays CO5: Analyse antenna measurements to assess antenna's performance. Identify the characteristics of radio wave propagation.	
SL NO	COURSE CODE: R203104B	COURSE NAME: ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
5	CO1: Select the instrument to be used based on the requirements. CO2: Understand and analyse different signal generators and analysers. CO3: Understand the design of oscilloscopes for different applications. CO4: Design different transducers for measurement of different parameters CO5: measuring voltmeters, multimeters and ac and dc devices.	
SL NO	COURSE CODE: PE1	COURSE NAME: COMPUTER ARCHITECTURE & ORGANIZATION
6	CO1: understand the architecture of modern computer. CO2: They can analyse the Performance of a computer using performance equation CO3: Understanding of different instruction types. CO4: Students can calculate the effective address of an operand by addressing modes CO5: They can understand how computer stores positive and negative numbers. CO6: Understand the concepts of I/O Organization and Memory systems.	

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SL NO	COURSE CODE: R2031044	COURSE NAME: ANALOG ICs AND APPLICATIONS LAB
7	CO1: Design and analyse the various linear application of op-amp CO2: Design and analyse the various non-linear application of op-amp. CO3: Design and analyse filter circuits using op-amp CO4: Design and analyse oscillators and multivibrator circuits using op-amp CO5: Design and analyse the various application of 555 timer. CO6: Analyse the performance of oscillators and multivibrators using PSPICE.	
SL NO	COURSE CODE: R2031045	COURSE NAME: DIGITAL COMMUNICATIONS LAB
8	CO1: Able to understand basic theories of Digital communication system in practical. CO2: Able to design and implement different modulation and demodulation techniques. CO3: Able to analyse digital modulation techniques by using MATLAB tools CO4: Able to identify and describe different techniques in modern digital communications; in particular in source coding using MAT Lab tools. CO5: Able to perform channel coding	
SL NO	COURSE CODE: R2031046	COURSE NAME: DATA STRUCTURES USING JAVA LAB
9	CO1: Be able to design and analyse the time and space efficiency of the data structure CO2: Be capable to identify the appropriate data structure for given problem CO3: Have practical knowledge on the applications of data structures	

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YEAR: IIIRDB.TECH

SEMESTER : IIND

SL NO	COURSE CODE:R2032041	COURSENAME: MICROPROCESSOR AND MICROCONTROLLERS
1	CO1: Understand the architecture of microprocessor/ microcontroller and their operation. CO2: Demonstrate programming skills in assembly language for processors and Controllers. CO3: Analyse various interfacing techniques and apply them for the design of processor / Controller based systems	
SL NO	COURSE CODE: R2032042	COURSE NAME: VLSI DESIGN
2	CO1: Demonstrate a clear understanding of CMOS fabrication flow and technology scaling. CO2. Apply the design Rules and draw layout of a given logic circuit. CO3. Design basic building blocks in Analog IC design. CO4. Analyze the behaviour of amplifier circuits with various loads. CO5. Design various CMOS logic circuits for design of Combinational logic circuits. CO6. Design MOSFET based logic circuits using various logic styles like static and dynamic CMOS. CO7. Design various applications using FPGA.	
SL NO	COURSE CODE: R2032043	COURSE NAME: DIGITAL SIGNAL PROCESSING
3	CO1: Apply the difference equations concept in the analysis of Discrete time systems CO2: Use the FFT algorithm for solving the DFT of a given signal CO3: Design a Digital filter (FIR&IIR) from the given specifications CO4: Realize the FIR and IIR structures from the designed digital filter. CO5: Use the Multirate Processing concepts in various applications (eg: Design of phase shifters, Interfacing of digital systems CO6: Apply the signal processing concepts on DSP Processor.	

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SL NO	COURSE CODE : (PE2)	COURSE NAME: MICROWAVE ENGINEERING
4		CO1: Design different modes in waveguide structures CO2: Calculate S-matrix for various waveguide components and splitting the microwave energy in a desired direction CO3: Distinguish between Microwave tubes and Solid State Devices, calculation of efficiency of devices. CO4: Measure various microwave parameters using a Microwave test bench
SL NO	COURSE CODE: R203204B	COURSE NAME: MOBILE & CELLULAR COMMUNICATION
5		CO1: Identify the limitations of conventional mobile telephone systems; understand the concepts of cellular systems. CO2: Understand the frequency management, channel assignment strategies and antennas in cellular systems. CO3: Understand the concepts of handoff and architectures of various cellular systems.
SL NO	COURSE CODE: (PE2)	COURSE NAME: EMBEDDED SYSTEMS
6		CO1: Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function. CO2: The hardware components required for an embedded system and the design approach of an embedded hardware. CO3: The various embedded firmware design approaches on embedded environment. CO4: Understand how to integrate hardware and firmware of an embedded system using real time operating system.

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SL NO	COURSE CODE: (PE2)	COURSE NAME: CMOS ANALOG IC DESIGN
7	CO1: Design MOSFET based analog integrated circuits. CO2: Analyse analog circuits at least to the first order. CO3: Appreciate the trade-offs involved in analog integrated circuit design. CO4: Understand and appreciate the importance of noise and distortion in analog circuits. CO5: Analyse complex engineering problems critically in the domain of analog IC design for conducting research	
SL NO	COURSE CODE: R2032044	COURSE NAME: MICROPROCESSOR AND MICROCONTROLLERS LAB
8	CO1: Understand and apply the fundamentals of assembly level programming of microprocessors and microcontroller. CO2: Work with standard microprocessor real time interfaces including GPIO, serial ports, digital-to-analog converters and analog-to-digital converters; CO3: Troubleshoot interactions between software and hardware; CO4: Analyze abstract problems and apply a combination of hardware and software to address the problem;	
SL NO	COURSE CODE: R2032045	COURSE NAME: VLSI DESIGN LAB
9	CO1: simulate circuits within a CAD tool and compare to design specifications; CO2: design, implement, and simulate circuits using VHDL. CO3: write machine language programs and assembly language programs for the simple computer. CO4: To learn by using Xilinx Foundation tools and Hardware Description Language (VHDL)	

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COLLEGE CODE
VSPT

SL NO	COURSE CODE: R2032046	COURSE NAME:
	DIGITAL SIGNAL PROCESSING LAB	
10	CO1: Examine the frequency response and impulse response of discrete-time LTI systems (L3). CO2 Interpret discrete-time signals using DFT (L3). CO3 Apply FFT algorithms for various signal processing operations (L3). CO4 Analyse IIR and FIR digital filters (L4). CO5 Design IIR and FIR digital filters for real time DSP applications (L5)	

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		with big data analytics and explore on Big Data applications Using Hive
	COs:5	Make use of Apache Spark, RDDs etc. to work with datasets
4.	Course code:08 MTCSE1103	Course: Digital Image Processing
	COs:1	Demonstrate the components of image processing.
	COs:2	Explain various filtration techniques
	COs:3	Apply image compression techniques.
	COs:4	Discuss the concepts of wavelet transforms.
	COs:5	Analyze the concept of morphological image processing.
5.	Course code:MTCSE1103	Course: Advanced Operating Systems
	COs:1	Illustrate on the fundamental concepts of distributed operating systems, its architecture and distributed mutual exclusion.
	COs:2	Analyze on deadlock detection algorithms and agreement protocols
	COs:3	Make use of algorithms for implementing DSM and its scheduling.
	COs:4	Apply protection and security in distributed operating systems.
	COs:5	Elaborate on concurrency control mechanisms in distributed database systems.
6.	Course code:MTCSE1103	Course: Advanced Computer Networks
	COs:1	Illustrate reference models with layers, protocols and interfaces.
	COs:2	Describe the routing algorithms, Sub netting and Addressing of IP V4and IPV6
	COs:3	Describe and Analysis of basic protocols of computer networks, and how they can be used to assist in network design and implementation.
	COs:4	Describe the concepts Wireless LANS, WIMAX, IEEE 802.11, Cellular telephony and Satellite networks
	COs:5	Describe the emerging trends in networks-MANETS and WSN
7.	Course code:MTCSE1104	Course: Internet of Things
	COs:1	Summarize on the term 'internet of things' in different contexts.
	COs:2	Analyze various protocols for IoT
	COs:3	Design a PoC of an IoT system using Raspberry Pi/Arduino
	COs:4	Apply data analytics and use cloud offerings related to IoT
	COs:5	Analyze applications of IoT in real time scenario

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8.	Course code:MTCSE1104	Course: Object Oriented Software Engineering
	COs:1	Apply the Object Oriented Software-Development Process to design software.
	COs:2	Analyze and Specify software requirements through a SRS documents.
	COs:3	Design and Plan software solutions to problems using an object-oriented strategy.
	COs:4	Model the object oriented software systems using Unified Modeling Language (UML)
	COs:5	Estimate the cost of constructing object oriented software.
9.	Course code: MTCSE1105	Course: Research Methodology And IPR
	COs:1	Understand research problem formulation.
	COs:2	Analyze research related information
	COs:3	Follow research ethics
	COs:4	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
	COs:5	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits
10.	Course code: MTCSE1106	Course: Advanced Data Structures & Algorithms Lab
	COs:1	Identify classes, objects, members of a class and relationships among them needed for a specific problem.
	COs:2	Examine algorithms performance using Prior analysis and asymptotic notations
	COs:3	Organize and apply to solve the complex problems using advanced data structures (like arrays, stacks, queues, linked lists, graphs and trees.)
	COs:4	Apply and analyze functions of Dictionary
11.	Course code: MTCSE1107	Course: Advanced Computing Lab
	COs:1	The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.
	COs:2	Development and use of s IoT technology in Societal and Industrial Applications.

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	COs:3	Skills to undertake high quality academic and industrial research in Sensors and IoT.
	COs:4	To classify Real World IoT Design Constraints, Industrial Automation in IoT.
YEAR:I M.Tech		SEMESTER:II
12.	Course code:MTCSE1201	Course: Machine Learning
	COs:1	Domain Knowledge for Productive use of Machine Learning and Diversity of Data.
	COs:2	Demonstrate on Supervised and Computational Learning
	COs:3	Analyze on Statistics in learning techniques and Logistic Regression
	COs:4	Illustrate on Support Vector Machines and Perceptron Algorithm
	COs:5	Design a Multilayer Perceptron Networks and classification of decision tree
13.	Course code: MTCSE1202	Course: MEAN Stack Technologies
	COs:1	Develop web Applications using Scripting Languages & Frameworks
	COs:2	Identify the Basic Concepts of Web & Markup Languages.
	COs:3	Illustrate the uses of web services concepts like restful, react js.
	COs:4	Make use of Express JS and Node JS frameworks
	COs:5	Adapt to Deployment Techniques & Working with cloud platform
14.	Course code: MTCSE1203	Course: Advanced Databases and Mining
	COs:1	Analyze on normalization techniques.
	COs:2	Elaborate on concurrency control techniques and query optimization.
	COs:3	Summarize the concepts of data mining, data warehousing and data preprocessing strategies
	COs:4	Apply data mining algorithms.
	COs:5	Assess various classification & cluster techniques.
15.	Course code: MTCSE1203	Course: Ad Hoc & Sensor Networks
	COs:1	Explain the Fundamental Concepts and applications of ad hoc and wireless sensor networks
	COs:2	Discuss the MAC protocol issues of ad hoc networks
	COs:3	Enumerate the concept of routing protocols for ad hoc wireless

		networks with respect to TCP design issues
	COs:4	Analyze & Specify the concepts of network architecture and MAC layer protocol for WSN
	COs:5	Discuss the WSN routing issues by considering QoS measurements
16.	Course code: MTCSE1203	Course: Soft Computing
	COs:1	Elaborate fuzzy logic and reasoning to handle uncertainty in engineering problems.
	COs:2	Make use of genetic algorithms to combinatorial optimization problems.
	COs:3	Distinguish artificial intelligence techniques, including searchheuristics, knowledge representation, planning and reasoning.
	COs:4	Formulate and apply the principles of self-adopting and self organizing neuro fuzzy inference systems.
	COs:5	Evaluate and compare solutions by various soft computing approaches for a given problem
17.	Course code: MTCSE1204	Course: Cloud Computing
	COs:1	Interpret the key dimensions of the challenge of Cloud Computing.
	COs:2	Examine the economics, financial, and technological implications for selecting cloud computing for own organization.
	COs:3	Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
	COs:4	Evaluate own organizations' needs for capacity building and training in cloud computing-related IT areas.
	COs:5	To Illustrate Virtualization for Data-Center Automation
18.	Course code: MTCSE1204	Course: Principles of Computer Security
	COs:1	Describe the key security requirements of confidentiality, integrity, and availability, types of security threats and attacks and summarize the functional requirements for computer security.
	COs:2	Explain the basic operation of symmetric block encryption algorithms, use of secure hash functions for message authentication, digital signature mechanism.
	COs:3	Discuss the issues involved and the approaches for user authentication and explain how access control fits into the broader context that includes authentication, authorization, and audit.
	COs:4	Explain the basic concept of a denial-of-service attack, nature of flooding attacks, distributed denialof-service attacks and describe how computer security vulnerabilities are a result of poor programming practices.

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	COs:5	List the steps used to secure the base operating system, specific aspects of securing Unix/Linux systems, Windows systems, and security in virtualized systems and describe the security threats and countermeasures for wireless networks.
19.	Course code: MTCSE1204	Course: High Performance Computing
	COs:1	Design, formulate, solve and implement high performance versions of standard single threaded algorithms.
	COs:2	Demonstrate the architectural features in the GPU and MIC hardware accelerators
	COs:3	Design programs to extract maximum performance in a multicore, shared memory execution environment processor.
	COs:4	Analyze Symmetric and Distributed architectures.
	COs:5	Develop and deploy large scale parallel programs on tightly coupled parallel systems using the message passing paradigm.
20.	Course code: MTCSE1205	Course: Machine Learning with Python Lab
	COs:1	Implement procedures for the machine learning algorithms
	COs:2	Design Python programs for various Learning algorithms
	COs:3	Apply appropriate data sets to the Machine Learning algorithms
	COs:4	Identify and apply Machine Learning algorithms to solve real world problems
21.	Course code: MTCSE1206	Course: MEAN Stack Technologies Lab
	COs:1	Identify the Basic Concepts of Web & Markup Languages.
	COs:2	Develop web Applications using Scripting Languages & Frameworks.
	COs:3	Creating & Running Applications using JSP libraries.
	COs:4	Creating Our First Controller Working with and Displaying in Angular Js and Nested Forms with ng-form.
	COs:5	Working with the Files in React JS and Constructing Elements with Data.
22.	Course code: MTCSE1207	Course: Mini Project with Seminar
23.	Course code: MTCSE1208	Course: AUDIT 1 and 2: CONSTITUTION OF INDIA
	COs:1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
	COs:2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

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	COs:3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
	COs:4	Discuss the passage of the Hindu Code Bill of 1956.
	YEAR:II M.Tech	SEMESTER:II
24.	Course code: MTCSE2101	Course: Deep Learning
	COs:1	Demonstrate the basic concepts fundamental learning techniques and layers.
	COs:2	Discuss the Neural Network training, various random models.
	COs:3	Explain different types of deep learning network models.
	COs:4	Classify the Probabilistic Neural Networks.
	COs:5	Implement tools on Deep Learning techniques.
25.	Course code: MTCSE2101	Course: Social Network Analysis
	COs:1	Demonstrate social network analysis and measures.
	COs:2	Analyze random graph models and navigate social networks data
	COs:3	Apply the network topology and Visualization tools.
	COs:4	Analyze the experiment with small world models and clustering models.
	COs:5	Compare the application driven virtual communities from social network Structure.
26.	Course code: OFFERED BY CSE DEPT	Course: Python Programming
	COs:1	Understand and comprehend the basics of python programming.
	COs:2	Demonstrate the principles of structured programming and be able to describe, design, implement, and test structured programs using currently accepted methodology.
	COs:3	Explain the use of the built-in data structures list, sets, tuples and dictionary.
	COs:4	Make use of functions and its applications.
	COs:5	Identify real-world applications using oops, files and exception handling provided by python.
27.	Course code: OFFERED BY CSE DEPT	Course: Principles of Cyber Security

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	COs:1	Apply cyber security architecture principles.
	COs:2	Describe risk management processes and practices.
	COs:3	Appraise cyber security incidents to apply appropriate response
	COs:4	Distinguish system and application security threats and vulnerabilities.
	COs:5	Identify security tools and hardening techniques
28.	Course code: OFFERED BY CSE DEPT	Course: Internet of Things
	COs:1	Summarize on the term 'internet of things' in different contexts.
	COs:2	Analyze various protocols for IoT
	COs:3	Design a PoC of an IoT system using Raspberry Pi/Arduino
	COs:4	Apply data analytics and use cloud offerings related to IoT.
	COs:5	Analyze applications of IoT in real time scenario
29.	Course code: OFFERED BY CSE DEPT	Course: Machine Learning
	COs:1	Domain Knowledge for Productive use of Machine Learning and Diversity of Data.
	COs:2	Demonstrate on Supervised and Computational Learning
	COs:3	Analyze on Statistics in learning techniques and Logistic Regression
	COs:4	Illustrate on Support Vector Machines and Perceptron Algorithm
	COs:5	Design a Multilayer Perceptron Networks and classification of decision tree
30.	Course code: OFFERED BY CSE DEPT	Course: Digital Forensics
	COs:1	Understand relevant legislation and codes of ethics
	COs:2	Computer forensics and digital detective and various processes, policies and procedures.
	COs:3	E-discovery, guidelines and standards, E-evidence, tools and environment.
	COs:4	Email and web forensics and network forensics
31.	Course code: OFFERED BY CSE DEPT	Course: Next Generation Databases
	COs:1	Explore the relationship between Big Data and NoSQL databases
	COs:2	Work with NoSQL databases to analyze the big data for useful

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		business applications.
	COs:3	Work with different data models to suit various data representation and storage needs
32.	Course code: MTCSE2103& MTCSE2201	Course: (DISSERTATION) DISSERTATION PHASE – I AND PHASE – I
	COs:1	Ability to synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem.
	COs:2	Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
	COs:3	Ability to present the findings of their technical solution in a written report.
	COs:4	Presenting the work in International/ National conference or reputed journals
33.	Course code: MTCSE1108& MTCSE1208	Course: AUDIT 1 and 2: PEDAGOGY STUDIES
	COs:1	What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
	COs:2	What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
	COs:3	How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
34.	Course code: MTCSE1108& MTCSE1208	Course: AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA
	COs:1	Develop healthy mind in a healthy body thus improving social health also 2.
	COs:2	Improve efficiency
35.	Course code: MTCSE1108& MTCSE1208	Course: AUDIT 1 and 2: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS
	COs:1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life.
	COs:2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity
	COs:3	Study of Neetishatakam will help in developing versatile personality of student .

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

YEAR : IVTH B.TECH

SEMESTER : IST

S.NO	COURSE CODE : R2041021	COURSE NAME: OPTICAL COMMUNICATION (PE-3)
1	CO1. Choose necessary components required in modern optical communications systems . CO2. Design and build optical fiber experiments in the laboratory, and learn how to calculate electromagnetic modes in waveguides, the amount of light lost going through an optical system, dispersion of optical fibers. CO3. Use different types of photo detectors and optical test equipment to analyze optical fiber and light wave systems. CO4. Choose the optical cables for better communication with minimum losses CO5. Design, build, and demonstrate optical fiber experiments in the laboratory.	
2	COURSE CODE : R2041022	COURSE NAME: DIGITAL IMAGE PROCESSING (PE-3)
	CO1. Perform image manipulations and different digital image processing techniques. CO2. Perform basic operations like – Enhancement, segmentation, compression, Image transforms and restoration techniques on image. CO3. Analyze pseudo and full color image processing techniques. CO4. Apply various morphological operators on images	
3	COURSE CODE : R2041023	COURSE NAME: OPTICAL COMMUNICATION (PE-3)
	CO1. Choose necessary components required in modern optical communications systems . CO2. Design and build optical fiber experiments in the laboratory, and learn how to calculate electromagnetic modes in waveguides, the amount of light lost going through an optical system, dispersion of optical fibers. CO3. Use different types of photo detectors and optical test equipment to analyze optical fiber and light wave systems. CO4. Choose the optical cables for better communication with minimum losses CO5. Design, build, and demonstrate optical fiber experiments in the laboratory.	
4	COURSE CODE : R2041024	COURSE NAME: LOW POWER VLSI DESIGN (PE-3)


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	<p>CO1. Capability to recognize advanced issues in VLSI systems, specific to the deep-submicron silicon Technologies.</p> <p>CO2. Students able to understand deep submicron CMOS technology and digital CMOS design styles.</p> <p>CO3. To design chips used for battery-powered systems and high performance circuits.</p> <p>CO4. Learn the design of various CMOS dynamic logic circuits.</p> <p>CO5. Learn the design techniques low voltage and low power CMOS circuits for various applications.</p> <p>CO6. Learn the different types of memory circuits and their design.</p>
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5	COURSE CODE : R2041025	COURSE NAME: SATELLITE COMMUNICATION (PE-4)
	<p>CO1. Understand the concepts, applications and subsystems of Satellite communications.</p> <p>CO2. Derive the expression for G/T ratio and to solve some analytical problems on satellite link design.</p> <p>CO3. Understand the various types of multiple access techniques and architecture of earth station design.</p> <p>CO4. Understand the concepts of GPS and its architecture.</p>	
6	COURSE CODE : R2041026	COURSE NAME: SOFT COMPUTING TECHNIQUES (PE-4)
	<p>CO1. Develop intelligent systems leveraging the paradigm of soft computing techniques.</p> <p>CO2. Implement, evaluate and compare solutions by various soft computing approaches for finding the optimal solutions.</p> <p>CO3. Recognize the feasibility of applying a soft computing methodology for a particular problem</p> <p>CO4. Design the methodology to solve optimization problems using fuzzy logic, genetic algorithms and neural networks.</p> <p>CO5. Design hybrid system to revise the principles of soft computing in various</p>	
7	COURSE CODE : R2041027	COURSE NAME: DIGITAL IC DESIGN USING CMOS (PE-4)
	<p>CO1. Understand the concepts of MOS Design.</p> <p>CO2. Design and analysis of Combinational and Sequential MOS Circuits.</p> <p>CO3. Extend the Digital IC Design to Different Applications.</p> <p>CO4. Understand the Concepts of Semiconductor Memories, Flash Memory, RAM array organization.</p>	



8	COURSE CODE : R2041028	COURSE NAME: RADAR ENGINEERING (PE-5)
	<p>CO1. Derive the radar range equation and to solve some analytical problems. CO2. Understand the different types of radars and its applications. CO3. Understand the concept of tracking and different tracking techniques. CO4. Understand the various components of radar receiver and its performance.</p>	
9	COURSE CODE : R2041029	COURSE NAME: PATTERN RECOGNITION & MACHINE LEARNING (PE-5)
	<p>CO1. Study the parametric and linear models for classification CO2. Design neural network and SVM for classification CO3. Develop machine independent and unsupervised learning techniques.</p>	
10	COURSE CODE : R2041030	COURSE NAME: INTERNET OF THINGS (PE-5)
	<p>CO1. Understand internet of Things and its hardware and software components. CO2. Interface I/O devices, sensors & communication modules. CO3. Remotely monitor data and control devices. CO4. Design real time IoT based applications</p>	
11	COURSE CODE : R2041031	COURSE NAME: BASICS OF SIGNALS AND SYSTEMS (OE)
	<p>CO1. Understand linear time invariant systems. CO2. Apply the concepts of Fourier series representations to analyze continuous and discrete time periodic signals. CO3. Understand and apply the continuous time Fourier transform, discrete time Fourier transform, CO4. Apply the concepts of Laplace transform, and z-Transform to the analysis and description of LTI continuous and discrete-time systems array organization.</p>	



12	COURSE CODE : R2041032	COURSE NAME: ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (OE)
<p>CO1. Select the instrument to be used based on the requirements. CO2. Understand and analyze different signal generators and analyzers. CO3. Understand the design of oscilloscopes for different applications. CO4. Design different transducers for measurement of different parameters.</p>		
13	COURSE CODE : R2041033	COURSE NAME: TRANSDUCERS AND SENSORS (OE)
<p>CO1. Use concepts in common methods for converting a physical parameter into an electrical quantity CO2. Classify and explain with examples of transducers, including those for measurement of temperature, strain, motion, position and light CO3. Choose proper sensor comparing different standards and guidelines to make sensitive measurements of physical parameters like pressure, flow, acceleration, etc CO4. Predict correctly the expected performance of various sensors CO5. Locate different type of sensors used in real life applications and paraphrase their importance CO6. Set up testing strategies to evaluate performance characteristics of different types of sensors and transducers. CO7. develop professional skills in acquiring and applying the knowledge outside the classroom through design of a real-life instrumentation system, signal processing applications</p>		
14	COURSE CODE : R2041034	COURSE NAME: IOT AND APPLICATIONS (OE)
<p>CO1. Understand internet of Things and its hardware and software components. CO2. Interface I/O devices, sensors & communication modules. CO3. Remotely monitor data and control devices. CO4. Design real time IoT based applications</p>		
15	COURSE CODE : R2041035	COURSE NAME: SOFT COMPUTING TECHNIQUES (OE)


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	<p>CO1. Develop intelligent systems leveraging the paradigm of soft computing techniques. CO2. Implement, evaluate and compare solutions by various soft computing approaches for finding the optimal solutions. CO3. Recognize the feasibility of applying a soft computing methodology for a particular problem CO4. Design the methodology to solve optimization problems using fuzzy logic, genetic algorithms and neural networks. CO5. Design hybrid system to revise the principles of soft computing in various application</p>	
16	COURSE CODE : R2041036	COURSE NAME: IC APPLICATIONS (OE)
	<p>CO1. Analyse the Differential Amplifier with Discrete components CO2. Describe the Op-Amp and internal Circuitry: 555 Timer, PLL CO3. Discuss the Applications of Operational amplifier: 555 Timer, PLL CO4. Design the digital application using digital ICs CO5. Use the Op-Amp in A to D & D to A Converters</p>	

17	COURSE CODE : R2041037	COURSE NAME: PRINCIPLES OF COMMUNICATIONS (OE)
	<p>CO1. Analyze the performance of analog modulation schemes in time and frequency domains. CO2. Analyze the performance of angle modulated signals. CO3. Characterize analog signals in time domain as random processes and noise CO4. Characterize the influence of channel on analog modulated signals CO5. Determine the performance of analog communication systems in terms of SNR CO6. Analyze pulse amplitude modulation, pulse position modulation, pulse code modulation and TDM systems.</p>	
18	COURSE CODE : R2041038	COURSE NAME: BASIC ELECTRONICS (OE)
	<p>CO1. Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation. CO2. Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons. CO3. Understand the construction, principle of operation of transistors,</p>	


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19	COURSE CODE : R2041039	COURSE NAME: DATA COMMUNICATIONS (OE)
<p>CO1. Know the Categories and functions of various Data communication Networks CO2. Design and analyze various error detection techniques. CO3. Demonstrate the mechanism of routing the data in network layer CO4. Know the significance of various Flow control and Congestion control Mechanisms</p>		
20	COURSE CODE : R2041040	COURSE NAME: DIGITAL LOGIC DESIGN (OE)
<p>CO1. Classify different number systems and apply to generate various codes. CO2. Use the concept of Boolean algebra in minimization of switching functions CO3. Design different types of combination a logic circuits. CO4. Apply knowledge of flip-flops in designing of Registers and counters CO5. The operation and design methodology for synchronous sequential circuits and algorithmic state machines CO6. Produce innovative designs by modifying the traditional design techniques</p>		
21	COURSE CODE : R2041041	COURSE NAME: REMOTE SENSING AND GIS (OE)
<p>CO1. Retrieve the information content of remotely sensed data CO2. Analyze the energy interactions in the atmosphere and earth surface features CO3. Interpret the images for preparation of thematic maps CO4. Apply problem specific remote sensing data for engineering applications CO5. Analyze spatial and attribute data for solving spatial problems CO6. Create GIS and cartographic outputs for presentation</p>		
22	COURSE CODE : R2041042	COURSE NAME: BIO MEDICAL INSTRUMENTATION (OE)


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08763201000



COLLEGE CODE
VSPT

	<p>CO1. Apply principles and concepts of electronics to analyze input and output signals in medical electronics</p> <p>CO2. Apply principles and concepts of electronics to design filters for de-noising of medical measurements</p> <p>CO3. Recognize different types of transducers, ongoing progress in improving their design, and their application in medical measurements</p> <p>CO4. Apply principles and concepts of engineering to quantify and model measurements of bio potentials</p> <p>CO5. Apply principles and concepts of sensing and engineering to (i) design diagnostic devices for detection of markers in biofluids, and (ii) be able to evaluate quality of diagnostic devices</p> <p>CO6. Apply engineering tools to evaluate parameters needed for point-of-care health screening and mobile-health, and design of appropriate point-of-care diagnostic devices</p>
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HoD

Head of the Department
Department ECE
Visakha Institute of Engg. & Tech

Principal

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8th Division, Narava, Visakhapatnam-27



DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

YEAR: Ist M.Tech

SEMESTER: Ist

S.NO	COURSE CODE : M6801	COURSE NAME: RTL Simulation and Synthesis with PLDs
1	CO1: Develop the Verilog HDL to design a digital circuit. CO2: Appreciate the analysis of finite state machine of a controlling circuit CO3: Understand the Static Timing Analysis and clock issues in digital circuits. CO4: Verify the functionality of the digital designs using PLDs.	
	COURSE CODE : M5502	COURSE NAME: Microcontrollers and Programmable Digital Signal Processors
2	CO1: Compare and select ARM processor core based SoC with several features/peripherals based on requirements of embedded applications. CO2: Identify and characterize architecture of Programmable DSP Processors CO3: Develop small applications by utilizing the ARM processor core and DSP processor based platform.	
	COURSE CODE : M5504	COURSE NAME: Digital Signal and Image Processing
3	CO1: Analyze discrete-time signals and systems in various domains (i.e Time, Z and Fourier) CO2: Design the digital filters (both IIR and FIR) from the given specifications CO3: Analyze the quantization effects in digital filters and understand the basics of image sampling, quantization and image transforms. CO4: Understand the concepts of image enhancement, image restoration and image segmentation. CO5: Know the various methods involved in image compression and fundamentals in color image processing.	
	COURSE CODE : M5505	COURSE NAME: Parallel Processing
4	CO1: Identify limitations of different architectures of computer CO2: Analysis quantitatively the performance parameters for different architectures CO3: Investigate issues related to compilers and instruction set based on type of architectures.	
	COURSE CODE : M5506	COURSE NAME: VLSI signal processing
5	CO1: Ability to modify the existing or new DSP architectures suitable for VLSI, CO2: Understand the concepts of folding and unfolding algorithms and applications: CO3: Ability to implement fast convolution algorithms. CO4: Low power design aspects of processors for signal processing and wireless applications.	
	COURSE CODE : M5507	COURSE NAME: Programming Languages for Embedded Systems
6	CO1: Ability to modify the existing or new DSP architectures suitable for VLSI, CO2: Understand the concepts of folding and unfolding algorithms and applications. CO3: Ability to implement fast convolution algorithms. CO4: Low power design aspects of processors for signal processing and wireless applications.	
	COURSE CODE : M5503	COURSE NAME: System Design with Embedded Linux
7	CO1: Get the familiarity about embedded Linux development model. CO2: Write and debug applications and drivers in embedded Linux. CO3: Understand and create Linux BSP for a hardware platform	

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	COURSE CODE : M5508	COURSE NAME: CAD of Digital System
8	CO1: Fundamentals of CAD tools for modelling, design, test and verification of VLSI systems. CO2: Understand various phases of CAD, including simulation, physical design, test and Verification. CO3: Demonstrate knowledge of computational algorithms and tools for CAD.	
	COURSE CODE : M0109	COURSE NAME: Research methodology and IPR
9	CO1: Analyze research related information CO2: Follow research ethics CO3: Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity. CO4: Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasise the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular. CO5: Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.	
	COURSE CODE : M6801	COURSE NAME: RTL Simulation and Synthesis with PLDs Lab
10	CO1: Identify, formulate, solve and implement problems in signal processing, communication CO2: Systems etc using RTL design tools. CO3: Use EDA tools like Cadence, Mentor Graphics and Xilinx.	
	COURSE CODE : M6802	COURSE NAME: Microcontrollers and Programmable Digital Signal Processors Lab
11	CO1: Install, configure and utilize tool sets for developing applications based on ARM processor CO2: Core SoC and DSP processor. CO3: Develop prototype codes using commonly available on and off chip peripherals on the Cortex M3 and DSP development boards.	

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

YEAR: Ist M.Tech

SEMESTER: IInd

S.NO	COURSE CODE : M7801	COURSE NAME: Analog and Digital CMOS VLSI Design
1	<p>C01. Appreciate the trade-offs involved in analog integrated circuit design.</p> <p>C02. Understand and appreciate the importance of noise and distortion in analog circuits.</p> <p>C03. Analyze complex engineering problems critically in the domain of analog IC design for Conducting research.</p> <p>C04. Demonstrate advanced knowledge in Static and dynamic characteristics of CMOS, Alternative CMOS Logics, Estimation of Delay and Power, Adders Design.</p> <p>C05. Solve engineering problems for feasible and optimal solutions in the core area of digital ICs.</p>	
	COURSE CODE : M7802	COURSE NAME: Real Time Operating Systems
2	<p>C01. Illustrate real time programming concepts.</p> <p>C02. Apply RTOS functions to implement embedded applications</p> <p>C03. Understand fundamentals of design consideration for embedded applications</p>	
	COURSE CODE : M7803	COURSE NAME: Memory Architectures
3	<p>C01. Select architecture and design semiconductor memory circuits and subsystems.</p> <p>C02. Identify various fault models, modes and mechanisms in semiconductor memories and their testing procedures.</p> <p>C03. Know how the state-of-the-art memory chip design</p>	
	COURSE CODE : M7804	COURSE NAME: SoC Design
4	<p>C01. Identify and formulate a given problem in the framework of SoC based design approaches Design</p> <p>C02. SoC based system for engineering applications.</p> <p>C03. Realize impact of SoC on electronic design philosophy and Macro-electronics thereby</p> <p>C04. Incline towards entrepreneurship & skill development</p>	
	COURSE CODE : M7805	COURSE NAME: Low power VLSI Design
5	<p>C01. Identify the sources of power dissipation in digital IC systems & understand the impact of power on system performance and reliability.</p> <p>C02. Characterize and model power consumption & understand the basic analysis methods.</p> <p>C03. Understand leakage sources and reduction techniques</p>	
	COURSE CODE : M7806	COURSE NAME: Communication Buses and Interfaces
6	<p>C01. Select a particular serial bus suitable for a particular application.</p> <p>C02. Develop APIs for configuration, reading and writing data onto serial bus.</p> <p>C03. Design and develop peripherals that can be interfaced to desired serial bus.</p>	
	COURSE CODE : M7807	COURSE NAME: Network Security and Cryptography
7	<p>C01. Identify and utilize different forms of cryptography techniques.</p> <p>C02. Incorporate authentication and security in the network applications.</p> <p>C03. Distinguish among different types of threats to the system and handle the same.</p>	
	COURSE CODE : M7808	COURSE NAME:

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		.Physical design automation
8	<p>C01. Understand the relationship between design automation algorithms and Various constraints posed by VLSI fabrication and design technology,</p> <p>C02. Adapt the design algorithms to meet the critical design parameters.</p> <p>C03. Identify layout optimization techniques and map them to the algorithms develop proto-type EDA tool and test its efficiency</p>	
	COURSE CODE : M8801	COURSE NAME: Analog and Digital CMOS VLSI Design lab
9	<p>C01. Analyze VI Characteristics NMOS and PMOS Devices,</p> <p>C02. Analyze Voltage transfer characteristics of CMOS inverter.</p> <p>C03. Demonstrate transient and ac analysis of CMOS inverter.</p> <p>C04. Calculate small signal voltage gain of CS amplifier.</p> <p>C05. Design the layout of a minimum size inverter.</p>	
	COURSE CODE : M8802	COURSE NAME: Real Time Operating Systems Lab
10	<p>C01. Analyze basic concepts of operating system and their structures.</p> <p>C02. Analyze various issues related to inter process communication like process scheduling, resource management and deadlocks.</p> <p>C03. Interpret the issues and challenges of memory management.</p> <p>C04. Synthesize the concepts of I/O management, file system implementation and problems related to security and protection</p>	

HOD

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Department: ECE
Visakha Institute of Engg. & Tech.

Principal

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

YEAR: IInd M.Tech

SEMESTER: Ist

S.NO	COURSE CODE :P6801	COURSE NAME: IOT and its Applications
1	<p>C01. Apply the Knowledge in IOT Technologies and Data management.</p> <p>C02. Determine the values chains Perspective of M2M to IOT.</p> <p>C03. Implement the state of the Architecture of an IOT.</p> <p>C04. Compare IOT Applications in Industrial & real world.</p> <p>C05. Demonstrate knowledge and understanding the security and ethical issues of an IOT.</p>	
	COURSE CODE : P6802	COURSE NAME: Hardware Software co-design
2	<p>C01. About the Hardware-Software Code sign Methodology.</p> <p>C02. How to select a target architecture and how a prototype is built and how emulation of a prototype is done.</p> <p>C03. Brief view about compilation technologies and compiler development environment.</p> <p>C04. Understand the importance of system level specification languages and multi-language co- simulation.</p>	
	COURSE CODE : P6803	COURSE NAME: Artificial Intelligence
3	<p>C01. Understand the concept of Artificial Intelligence, search techniques ,knowledge representation issues</p> <p>C02. Understanding reasoning and fuzzy logic for artificial intelligence</p> <p>C03. Understanding game playing and natural language processing</p>	
	COURSE CODE : P0301	COURSE NAME: Business Analytics
4	<p>C01. Students will demonstrate knowledge of data analytics.</p> <p>C02. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.</p> <p>C03. Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.</p> <p>C04. Students will demonstrate the ability to translate data into clear, actionable insights</p>	
	COURSE CODE : P0302	COURSE NAME: Industrial Safety
5	<p>C01. Appreciate the theoretical concepts and practices of industrial safety</p> <p>C02. Evaluate the state of safety based on various indices</p> <p>C03. Analyse the causes of accidents and prepare reports</p> <p>C04. Apply basic principles of management to safety</p> <p>C05. Develop and design the basic outlines of a safety programme</p>	
	COURSE CODE : P0303	COURSE NAME: Operations Research
6	<p>C01. Students will demonstrate knowledge of data analytics.</p> <p>C02. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.</p>	

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 With Division, Nara, GVMC, Visakhapatnam-530027



VSPT

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING M.Tech in POWER SYSTEMS

YEAR: Ist**SEMESTER: Ist**

Sl. No.	COURSE CODE:	M9901	COURSE NAME:	POWER SYSTEM OPERATION & CONTROL
1	CO1:	Determine the unit commitment problem for economic load dispatch.		
	CO2:	Get the knowledge of load frequency control of single area system with and without control.		
	CO3:	Get the knowledge of load frequency control of two area system with and without control.		
	CO4:	Know the effect of generation with limited energy supply.		
	CO5:	Determine the interchange evaluation in interconnected power systems.		
2	COURSE CODE:	M4302	COURSE NAME:	ANALYSIS OF POWER ELECTRONIC CONVERTERS
	CO1:	Describe and analyze the operation of AC-DC converters.		
	CO2:	Analyze the operation of power factor correction converters.		
	CO3:	Analyze the operation of three phase inverters with PWM control.		
	CO4:	Study the principles of operation of multi-level inverters and their applications.		
3	COURSE CODE:	M9904	COURSE NAME:	ELECTRICAL DISTRIBUTION AUTOMATION (ELECTIVE-B)
	CO1:	Analyze a distribution system.		
	CO2:	Design equipment for distribution system and sub-stations.		
	CO3:	Design protective systems and co-ordinate the devices.		
	CO4:	Understand of capacitive compensation.		
4	COURSE CODE:	M4306	COURSE NAME:	RENEWABLE ENERGY TECHNOLOGIES (ELECTIVE-D)
	CO1:	Understand various general aspects of renewable energy systems.		
	CO2:	Analyze and design induction generator for power generation from wind.		
	CO3:	Design MPPT controller for solar power utilization.		
	CO4:	Utilize fuel cell systems for power generation.		
5	COURSE CODE:	M5601	COURSE NAME:	POWER SYSTEM DEREGULATION (ELECTIVE-D)
	CO1:	Understand of operation of deregulated electricity market systems.		
	CO2:	Typical issues in electricity markets.		
	CO3:	Analyse various types of electricity market operational and control issues using new mathematical models.		
	CO4:	Understand LMP's wheeling transactions and congestion management.		
6	COURSE CODE:	M6204	COURSE NAME:	HVDC TRANSMISSION (ELECTIVE-D)
	CO1:	Understand the various schemes of HVDC transmission.		
	CO2:	Understand the basic HVDC transmission equipment.		
	CO3:	Understand the control of HVDC systems.		
	CO4:	Understand the interaction between HVAC and HVDC system.		
	CO5:	Understand the various protection schemes of HVDC engineering.		
CO6:	Understand the various schemes of HVDC transmission.			


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	COURSE CODE:	M9905	COURSE NAME:	ADVANCED POWER SYSTEMS PROTECTION (ELECTIVE -II)
7	CO1:	Know the classifications and applications of static relays.		
	CO2:	Understand the application of comparators.		
	CO3:	Understand the static version of different types of relays.		
	CO4:	Understand the numerical protection techniques.		
	COURSE CODE:	M5602	COURSE NAME:	POWER SYSTEM RELIABILITY (ELECTIVE -II)
8	CO1:	Understand reliability analysis applied to power systems.		
	CO2:	Understand Markov Chains and application to power systems.		
	CO3:	Perform stability analysis of generation systems.		
	CO4:	Understand decomposition techniques applied to power system.		
	COURSE CODE:	M5604	COURSE NAME:	POWER SYSTEMS LABORATORY
9	CO1:	After the completion of lab they will understand procedure for determination of various parameters used in power system as well as performance of transmission line.		
	COURSE CODE:	M5603	COURSE NAME:	POWER SYSTEM SIMULATION LABORATORY - I
10	CO1:	Analyse the performance of the various transmission lines in different loading conditions.		
	CO2:	Perform the load flow study on distribution systems.		
	CO3:	Calculate the different line parameters of 3-phase symmetrical and unsymmetrical transmission lines.		
	CO4:	Compute the reflection and refraction coefficients of voltages and currents in the transmission.		
	CO5:	Form the Z- and Y-bus matrices for the given power transmission system.		


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YEAR:1st

SEMESTER:IIInd

Sl.No.	COURSE CODE:	N9904	COURSE NAME:	POWER SYSTEM DYNAMICS AND STABILITY
1	CO1:	Determine the model of synchronous machines.		
	CO2:	Know the stability studies of synchronous machines.		
	CO3:	Get the knowledge of solution methods of transient stability.		
	CO4:	Know the effect of different excitation systems in power systems.		
2	COURSE CODE:	N9901	COURSE NAME:	REAL TIME CONTROL OF POWER SYSTEMS
	CO1:	Understand state estimation, security and contingency evaluation.		
	CO2:	Understand about Supervisory control and data acquisition.		
	CO3:	Real time software application to state estimation.		
3	CO4:	Understand application of AI in power system.		
	COURSE CODE:	N6205	COURSE NAME:	EHV AC TRANSMISSION (ELECTIVE-III)
	CO1:	Calculate the transmission line parameters.		
	CO2:	Calculate the field effects on EHV and UHV AC lines.		
	CO3:	Determine the corona, RI and audible noise in EHV and UHV lines.		
4	CO4:	Analyse voltage control and compensation problems in EHV and UHV transmission systems.		
	CO5:	Understand reactive power compensation using SVC and TCR.		
	COURSE CODE:	N6206	COURSE NAME:	FLEXIBLE AC TRANSMISSION SYSTEMS (ELECTIVE-III)
	CO1:	Know the performance improvement of transmission system with FACTS.		
5	CO2:	Get the knowledge of effect of static shunt and series compensation.		
	CO3:	Know the principle of operation and various controls of UPFC.		
	CO4:	Determine an appropriate FACTS device for different types of applications.		
5	COURSE CODE:	N6207	COURSE NAME:	HYBRID ELECTRIC VEHICLES (ELECTIVE-III)
	CO1:	Know the concept of electric vehicles and hybrid electric vehicles.		
	CO2:	Familiar with different motors used for hybrid electric vehicles.		
	CO3:	Understand the power converters used in hybrid electric vehicles.		
6	CO4:	Know different batteries and other energy storage systems.		
	COURSE CODE:	N5601	COURSE NAME:	GENERATION AND MEASUREMENT OF HIGH VOLTAGES (ELECTIVE-IV)
	CO1:	Understand numerical computation of electrostatic problems.		
	CO2:	Understand the techniques of generation of high AC, DC and transient voltages.		
6	CO3:	Measure high AC, DC and transient voltages.		
	CO4:	Measure high AC, DC and transient currents.		


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	COURSE CODE:	N5602	COURSE NAME:	EVOLUTIONARY ALGORITHMS AND APPLICATIONS (ELECTIVE-IV)
7	CO1:	State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.		
	CO2:	Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.		
	CO3:	Formulate a mathematical model and apply linear programming technique by using Simplex method. Also extend the concept of dual Simplex method for optimal solutions.		
	CO4:	Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions.		
	CO5:	Apply Genetic algorithms for simple electrical problems and able to solve practical problems using PSO.		
	COURSE CODE:	N5603	COURSE NAME:	PROGRAMMABLE LOGIC CONTROLLERS & APPLICATIONS (ELECTIVE-IV)
8	CO1:	Understand the PLCs and their I/O modules.		
	CO2:	Develop control algorithms to PLC using ladder logic etc.		
	CO3:	Manage PLC registers for effective utilization in different applications.		
	CO4:	Handle data functions and control of two axis and their axis robots with PLC.		
	CO5:	Design PID controller with PLC.		
	COURSE CODE:	N5604	COURSE NAME:	POWER SYSTEM SIMULATION LABORATORY-II
9	CO1:	The student should analyze load flow solution obtained using GS and NR methods, symmetrical and unsymmetrical faults, Transient stability and load frequency deviation in single and two area systems.		
	COURSE CODE:	N5605	COURSE NAME:	POWER CONVERTERS LABORATORY
10	CO1:	Students are able to implement the converter and inverters in real time applications.		


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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
M.Tech in POWER SYSTEMS

YEAR:IIInd

SEMESTER:IIIrd

Sl.No.	COURSE CODE:	P5601	COURSE NAME:	Energy Audit Conservation & Management (Program Elective-V)
1	CO1:	Understand the principle of energy audit and their economic aspects.		
	CO2:	Recommend energy efficient motors and design good lighting system.		
	CO3:	Understand advantages to improve the power factor.		
	CO4:	Evaluate the depreciation of equipment.		
	COURSE CODE:	P5602	COURSE NAME:	SMART GRID TECHNOLOGIES (ELECTIVE-V)
2	CO1:	Understand smart grids and analyze the smart grid policies and developments in smart grids.		
	CO2:	Develop concepts of smart grid technologies in hybrid electrical vehicles etc.		
	CO3:	Understand smart substations, feeder automation, GIS etc.		
	CO4:	Analyze micro grids and distributed generation systems.		
	CO5:	Analyze the effect of power quality in smart grid and to understand latest developments in ICT for smart grid.		
	COURSE CODE:	P5603	COURSE NAME:	POWER QUALITY AND CUSTOM POWER DEVICES (ELECTIVE-V)
3	CO1:	Identify the issues related to power quality in power systems.		
	CO2:	Address the problems of transient and long duration voltage variations in power systems.		
	CO3:	Analyze the effects of harmonics and study of different mitigation techniques.		
	CO4:	Identify the importance of custom power devices and their applications.		
	CO5:	Acquire knowledge on different compensation techniques to minimize power quality disturbances.		
	COURSE CODE:	POE02	COURSE NAME:	INDUSTRIAL SAFETY (OPEN ELECTIVE)
4	CO1:	Understand the general industrial requirements like lighting, cleanliness prevention from hazards and accidents.		
	CO2:	Analyze maintenance requirements of the industry and cost associated.		
	CO3:	Analyze wear and corrosion aspects of the industry and their prevention.		
	CO4:	Identify the faults prone areas and their repair and periodic maintenance.		
	COURSE CODE:	POE03	COURSE NAME:	ARTIFICIAL INTELLIGENT TECHNIQUES (OPEN ELECTIVE)
5	CO1:	Differentiate between Algorithmic based methods and knowledge based methods.		
	CO2:	Use appropriate AI framework for solving power system problems.		
	CO3:	To design fuzzy logic controllers for power engineering applications.		
	COURSE CODE:	POE04	COURSE NAME:	OPERATIONS RESEARCH (OPEN ELECTIVE)
6	CO1:	Students should able to apply the dynamic programming to solve problems of discrete and continuous variables.		
	CO2:	Students should able to apply the concept of non-linear programming.		
	CO3:	Students should able to carry out sensitivity analysis.		
	CO4:	Student should able to model the real world problem and simulate it.		


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YEAR:IIInd

SEMESTER:IVth

SL.No.	COURSE CODE:	NACB3	COURSE NAME:	AUDIT 1 and 2: SANSKRIT FOR TECHNICAL KNOWLEDGE
1	CO1:	Understanding basic Sanskrit language		
	CO2:	Ancient Sanskrit literature about science & technology can be understood		
	CO3:	Being a logical language will help to develop logic in students		
2	COURSE CODE:	NAC04	COURSE NAME:	AUDIT 1 and 2: VALUE EDUCATION
	CO1:	Knowledge of self-development		
	CO2:	Learn the importance of Human values		
	CO3:	Developing the overall personality		
3	COURSE CODE:	NAC05	COURSE NAME:	AUDIT 1 and 2: 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 and the eventual failure of the proposal of direct elections through adult suffrage in the Indian.		
	CO4:	Discuss the passage of the Hindu Code Bill of 1956.		
4	COURSE CODE:	NAC06	COURSE NAME:	AUDIT 1 and 2: PEDAGOGY STUDIES
	CO1:	What pedagogical practices are being used by teachers in formal 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?		
5	COURSE CODE:	NAC07	COURSE NAME:	AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA
	CO1:	Develop healthy mind in a healthy body thus improving social health also		
	CO2:	Improve efficiency		
6	COURSE CODE:	NAC08	COURSE NAME:	AUDIT 1 and 2: PERSONALITY DEVELOPMENT THROUGH LIFE
	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 Study of Neetishatakam will help in developing versatile personality of students		


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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
YEAR: IIInd **SEMESTER: Ist**

Sl.No.	COURSE CODE:	R2021021	COURSE NAME:	MATHEMATICS-IV (Complex Variables and Statistical Methods)
1	CO1:	Apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic. (L3)		
	CO2:	Find the differentiation and integration of complex functions used in engineering problems. (L5)		
	CO3:	Make use of the Cauchy residue theorem to evaluate certain integrals. (L3)		
	CO4:	Apply discrete and continuous probability distributions. (L3)		
	CO5:	Design the components of a classical hypothesis test. (L6)		
	CO6:	Infer the statistical inferential methods based on small and large sampling tests. (L4)		
2	COURSE CODE:	R2021022	COURSE NAME:	ELECTRONIC DEVICES AND CIRCUITS
	CO1:	Understand the basic concepts of semiconductor physics.		
	CO2:	Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.		
	CO3:	Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.		
	CO4:	Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations.		
	CO5:	Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.		
CO6:	Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.			
3	COURSE CODE:	R2021023	COURSE NAME:	ELECTRICAL CIRCUIT ANALYSIS - II
	CO1:	Understand the concepts of balanced and unbalanced three-phase circuits.		
	CO2:	Know the transient behavior of electrical networks with DC excitations.		
	CO3:	Learn the transient behavior of electrical networks with AC excitations.		
	CO4:	Estimate various parameters of a two port network.		
CO5:	Understand the significance of filters in electrical networks.			
4	COURSE CODE:	R2021024	COURSE NAME:	DC MACHINES AND TRANSFORMERS
	CO1:	Assimilate the concepts of electromechanical energy conversion.		
	CO2:	Mitigate the ill-effects of armature reaction and improve commutation in dc machines.		
	CO3:	Understand the torque production mechanism and control the speed of dc motors.		
	CO4:	Analyze the performance of single phase transformers.		
	CO5:	Predetermine regulation, losses and efficiency of single phase transformers.		
CO6:	Parallel transformers, control voltages with tap changing methods and achieve three-phase to two-phase transformation.			

5	COURSE CODE:	R2021025	COURSE NAME:	ELECTRO MAGNETIC FIELDS
	CO1:	Compute electric fields and potentials using Gauss law or solve Laplace's or Poisson's equations for various electric charge distributions		
	CO2:	Calculate the capacitance and energy stored in dielectrics.		
	CO3:	Calculate the magnetic field intensity due to current carrying conductor and understanding the application of Ampere's law, Maxwell's second and third law.		
	CO4:	Estimate self and mutual inductances and the energy stored in the magnetic field.		
	CO5:	Understand the concepts of displacement current and Poynting theorem and Poynting vector		
6	COURSE CODE:	R2021026	COURSE NAME:	ELECTRICAL CIRCUITS LAB
	CO1:	Apply various theorems.		
	CO2:	Determination of self and mutual inductances		
	CO3:	Two port parameters of a given electric circuits		
	CO4:	Draw locus diagrams		
	CO5:	Draw Waveforms and phasor diagrams for lagging and leading networks		
7	COURSE CODE:	R2021027	COURSE NAME:	DC MACHINES AND TRANSFORMERS LAB
	CO1:	Determine and predetermine the performance of DC machines and Transformers.		
	CO2:	Control the speed of DC motor.		
8	COURSE CODE:	R2021028	COURSE NAME:	ELECTRONIC DEVICES AND CIRCUITS LAB
	CO1:	Analyze the characteristics of diodes, transistors and other devices		
	CO2:	Design and implement the rectifier circuits, SCR and UJT in the hardware circuits.		
	CO3:	Design the biasing and amplifiers of BJT and FET amplifiers		
9	COURSE CODE:	R2021029	COURSE NAME:	SKILL ORIENTED COURSE DESIGN OF ELECTRICAL CIRCUITS USING ENGINEERING SOFTWARE TOOLS
	CO1:	Write the MATLAB programs to simulate the electrical circuit problems		
	CO2:	Simulate various circuits for electrical parameters.		
	CO3:	Simulate various wave form for determination of wave form parameters		
	CO4:	Simulate RLC series and parallel resonance circuits for resonant parameters		
	CO5:	Simulate magnetic circuits for determination of self and mutual inductances		
10	COURSE CODE:	R2021020	COURSE NAME:	PROFESSIONAL ETHICS & HUMAN VALUES
	CO1:	Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field		
	CO2:	Identify the multiple ethical interests at stake in a real-world situation or practice.		
	CO3:	Articulate what makes a particular course of action ethically defensible		
	CO4:	Assess their own ethical values and the social context of problems		
	CO5:	Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects.		
	CO6:	Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work		
CO7:	Integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic, professional, and interdisciplinary research.			

YEAR: IInd

SEMESTER: IInd

SL.No.	COURSE CODE:	R2022021	COURSE NAME:	PYTHON PROGRAMMING
1	CO1:	Develop essential programming skills in computer programming concepts like data types, containers.		
	CO2:	Apply the basics of programming in the Python language Solve coding tasks related		
	CO3:	Conditional execution, loops		
	CO4:	Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming		
2	COURSE CODE:	R2022022	COURSE NAME:	DIGITAL ELECTRONICS
	CO1:	Classify different number systems and apply to generate various codes.		
	CO2:	Use the concept of Boolean algebra in minimization of switching functions		
	CO3:	Design different types of combinational logic circuits.		
	CO4:	Apply knowledge of flip-flops in designing of Registers and counters		
CO5:	The operation and design methodology for synchronous sequential circuits and algorithmic state machines.			
3	COURSE CODE:	R2022023	COURSE NAME:	POWER SYSTEMS - I
	CO1:	Identify the different components of thermal power plants.		
	CO2:	Identify the different components of nuclear Power plants.		
	CO3:	Identify the different components of air and gas insulated substations.		
	CO4:	Identify single core and three core cables with different insulating materials.		
CO5:	Analyse the different economic factors of power generation and tariffs.			
4	COURSE CODE:	R2022024	COURSE NAME:	INDUCTION AND SYNCHRONOUS MACHINES
	CO1:	Explain the operation and performance of three phase induction motor.		
	CO2:	Analyze the torque-speed relation, performance of induction motor and induction generator		
	CO3:	Implement the starting of single phase induction motors.		
	CO4:	Develop winding design and predetermine the regulation of synchronous generators.		
CO5:	Explain hunting phenomenon, implement methods of starting and correction of power factor with synchronous motor			
5	COURSE CODE:	R2022015	COURSE NAME:	MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS
	CO1:	The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product.		
	CO2:	The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs		
	CO3:	The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units		
	CO4:	The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis.		
CO5:	The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.			
6	COURSE CODE:	R2022025	COURSE NAME:	PYTHON PROGRAMMING LAB
	CO1:	Write, Test and Debug Python Programs		
	CO2:	Use Conditionals and Loops for Python Programs		
	CO3:	Use functions and represent Compound data using Lists, Tuples and Dictionaries Use various applications: using python.		


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7	COURSE CODE:	R2022026	COURSE NAME:	INDUCTION AND SYNCHRONOUS MACHINES LAB
	CO1:	Assess the performance of single phase and three phase induction motors.		
	CO2:	Control the speed of three phase induction motor.		
	CO3:	Predetermine the regulation of three-phase alternator by various methods.		
	CO4:	Find the X_d/X_q ratio of alternator and assess the performance of three-phase synchronous motor		
CO5:	Determine the performance of single phase AC series motor			
8	COURSE CODE:	R2022027	COURSE NAME:	DIGITAL ELECTRONICS LAB
	CO1:	Learn the basics of gates, flip-flops and counters.		
	CO2:	Construct basic combinational circuits and verify their functionalities		
	CO3:	Apply the design procedures to design basic sequential circuits		
	CO4:	To understand the basic digital circuits and to verify their operation		
CO5:	Apply Boolean laws to simplify the digital circuits.			
9	COURSE CODE:	R2022028	COURSE NAME:	SKILL ORIENTED COURSE IIOT APPLICATIONS OF ELECTRICAL ENGINEERING.
	CO1:	Apply various technologies of Internet of Things to real time applications.		
	CO2:	Apply various communication technologies used in the Internet of Things.		
	CO3:	Connect the devices using web and internet in the IoT environment.		
CO4:	Implement IoT to study Smart Home, Smart city, etc.			
10	COURSE CODE:	R202202	COURSE NAME:	COMMUNICATION SYSTEMS (Honors Engineering Course)
	CO1:	Understand the basics of communication system, analog and digital modulation techniques.		
	CO2:	Apply the knowledge of digital electronics and understand the error control coding techniques.		
CO3:	Summarize different types of communication systems and its requirements.			
11	COURSE CODE:	R202202	COURSE NAME:	ELECTRICAL WIRING, ESTIMATION AND COSTING (Honors Engineering Course)
	CO1:	Demonstrate the various electrical apparatus and their interconnections.		
	CO2:	Examine various components of electrical installations.		
	CO3:	Estimate the cost for installation of wiring for different types of building and small industries		
	CO4:	Illustrate the components of electrical substations.		
CO5:	Design suitable control circuit for starting of three phase induction motor and synchronous motor			
12	COURSE CODE:	R202202	COURSE NAME:	ELECTRICAL DISTRIBUTION SYSTEMS (Honors Engineering Course)
	CO1:	Discriminate various factors of distribution system - load modelling and characteristic of loads.		
	CO2:	Know the concept of design considerations of substation and feeders.		
	CO3:	Determine the voltage drop and power loss for different types of distribution loads.		
	CO4:	Analyse the protection and its coordination for distribution systems.		
CO5:	Analyse the effect of compensation for p f improvement and voltage improvement			


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	COURSE CODE:	R202202	COURSE NAME:	FUNDAMENTALS OF ELECTRICAL CIRCUITS (Minors Engineering Course)
13	CO1:	Understand about the basic elements of electrical circuits.		
	CO2:	Learn to do steady state analysis of single-phase AC systems.		
	CO3:	Apply network theorems to analyze electrical circuits.		
	CO4:	Learn to analyze three-phase balanced and unbalanced circuits.		
	CO5:	Perform transient analysis of different RL, RC & RLC circuits.		
	COURSE CODE:	R202202	COURSE NAME:	CONCEPTS OF ELECTRICAL MEASUREMENTS (Minors Engineering Course)
14	CO1:	Choose right type of instrument for measurement of ac and dc voltage and current.		
	CO2:	Analyse the operation of wattmeter and energy meter.		
	CO3:	Differentiate the operation of AC and DC bridges.		
	CO4:	Describe the operation various Transducers.		
	CO5:	Know the importance of Digital Meters and their working principles.		


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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
YEAR:IIIrd SEMESTER:Ist

Sl. No.	COURSE CODE:	R2031021	COURSE NAME:	POWER SYSTEMS-II
1	CO1:	Calculate parameters of transmission lines for different circuit configurations.		
	CO2:	Determine the performance of short, medium and long transmission lines.		
	CO3:	Analyse the effect of travelling waves on transmission lines.		
	CO4:	Analyse the various voltage control methods and effect of corona.		
	CO5:	Calculate sag/tension of transmission lines and performance of line insulators.		
2	COURSE CODE:	R2031022	COURSE NAME:	POWER ELECTRONICS
	CO1:	Illustrate the static and dynamic characteristics of SCR, Power-MOSFET and Power-IGBT.		
	CO2:	Analyse the operation of phase-controlled rectifiers.		
	CO3:	Analyse the operation of three-phase full-wave converters, AC Voltage Controllers and Cycloconverters.		
	CO4:	Examine the operation and design of different types of DC-DC converters.		
	CO5:	Analyse the operation of PWM inverters for voltage control and harmonic mitigation.		
3	COURSE CODE:	R2031023	COURSE NAME:	CONTROL SYSTEMS
	CO1:	Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.		
	CO2:	Determine time response specifications of second order systems and absolute and relative stability of LTI systems using Routh's stability criterion and root locus method.		
	CO3:	Analyze the stability of LTI systems using frequency response methods.		
	CO4:	Design Lag, Lead, Lag-Lead compensators to improve system performance using Bode diagrams.		
	CO5:	Represent physical systems as state models and determine the response. Understand the concepts of controllability and observability.		
4	COURSE CODE:	R203102F	COURSE NAME:	RENEWABLE ENERGY SOURCES (OPEN ELECTIVE-I)
	CO1:	Analyze solar radiation data, extra-terrestrial radiation, radiation on earth's surface and solar Energy Storage.		
	CO2:	Illustrate the components of wind energy systems.		
	CO3:	Illustrate the working of biomass, digesters and Geothermal plants.		
	CO4:	Demonstrate the principle of Energy production from OTEC, Tidal and Waves.		
	CO5:	Evaluate the concept and working of Fuel cells & MHD power generation.		
5	COURSE CODE:	R203102G	COURSE NAME:	CONCEPTS OF OPTIMIZATION TECHNIQUES (OPEN ELECTIVE-I)
	CO1:	State and formulate the optimization problem without and with constraints; also apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints and arrive at an optimal solution.		
	CO2:	Formulate a mathematical model and apply linear programming technique by using Simplex method. Also extend the concept of dual Simplex method for optimal solutions.		
	CO3:	Formulate a mathematical model and apply non-linear programming techniques for unconstrained and constrained case studies.		
	CO4:	Solve transportation and assignment problem by using Linear programming Simplex method.		
	CO5:	Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution.		

	COURSE CODE:	R203102H	COURSE NAME:	CONCEPTS OF CONTROL SYSTEMS (OPEN ELECTIVE-I)
6	CO1:	Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.		
	CO2:	Determine time response specifications of second order systems and to determine error constants.		
	CO3:	Analyze absolute and relative stability of LTI systems using Routh's stability criterion and the root locus method.		
	CO4:	Analyze the stability of LTI systems using frequency response methods.		
	CO5:	Represent physical systems as state models and determine the response. Understanding the concepts of controllability and observability.		
	COURSE CODE:	R203102A	COURSE NAME:	LINEAR IC APPLICATIONS (PROFESSIONAL ELECTIVE - I)
7	CO1:	Describe the Op-Amp and internal Circuitry: 555 Timer, PLL.		
	CO2:	Discuss the Applications of Operational amplifier: 555 Timer, PLL.		
	CO3:	Design the Active filters using Operational Amplifier		
	CO4:	Use the Op-Amp in A to D & D to A Converters		
	COURSE CODE:	R203102B	COURSE NAME:	UTILIZATION OF ELECTRICAL ENERGY (PROFESSIONAL ELECTIVE - I)
8	CO1:	Identify various illumination methods produced by different illuminating sources		
	CO2:	Identify a suitable motor for electric drives and industrial applications.		
	CO3:	Identify most appropriate heating and welding techniques for suitable applications.		
	CO4:	Distinguish various traction system and determine the tractive effort and specific energy consumption.		
	CO5:	Validate the necessity and usage of different energy storage schemes for different applications and comparisons.		
	COURSE CODE:	R203102C	COURSE NAME:	COMPUTER ARCHITECTURE AND ORGANIZATION (PROFESSIONAL ELECTIVE - I)
9	CO1:	Explain the instruction cycle of a computer.		
	CO2:	Understand various micro operations and register transfer language.		
	CO3:	Describe parallel processing and pipelining.		
	CO4:	Interface different peripherals with processors.		
	CO5:	Know the advantages of cache and virtual memory.		
	COURSE CODE:	R203102D	COURSE NAME:	OPTIMIZATION TECHNIQUES (PROFESSIONAL ELECTIVE - II)
10	CO1:	State and formulate the optimization problem without and with constraints, also apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints and arrive at an optimal solution.		
	CO2:	Formulate a mathematical model and apply linear programming technique by using Simplex method. Also extend the concept of dual Simplex method for optimal solutions.		
	CO3:	Formulate a mathematical model and apply non-linear programming techniques for unconstrained and constrained case studies.		
	CO4:	Solve transportation and assignment problem by using Linear programming Simplex method.		
	CO5:	Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution.		
	COURSE CODE:	R203102E	COURSE NAME:	OBJECT ORIENTED PROGRAMMING THROUGH JAVA (PROFESSIONAL ELECTIVE - I)
11	CO1:	Discuss and understand java programming constructs, Control structures		
	CO2:	Illustrate and experiment Object-Oriented Concepts like classes, objects.		
	CO3:	Apply Object Oriented Constructs such as Inheritance, interfaces, and exception handling		
	CO4:	Construct applications using multithreading and IO.		
	CO5:	Develop Dynamic User Interfaces using applets and Event Handling in java		


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12	COURSE CODE:	R2031024	COURSE NAME:	CONTROL SYSTEMS LABORATORY
	CO1:	Analyze the performance and working Magnetic amplifier, D.C. and A.C. servo motors and synchros.		
	CO2:	Design P,PI,PD and PID controllers.		
	CO3:	Design lag, lead and lag-lead compensators		
	CO4:	Evaluate temperature control of an oven using PID controller		
	CO5:	Determine the transfer function of D.C Motor		
	CO6:	Analyze the performance of D.C and A.C Servo Motor		
	CO7:	Test the controllability and observability.		
	CO8:	Judge the stability in time and frequency domain.		
	CO9:	To examine different logic gates and Boolean expressions using PLC.		
13	COURSE CODE:	R2031025	COURSE NAME:	POWER ELECTRONICS LABORATORY
	CO1:	Analyse characteristics of various power electronic devices and design firing circuits for SCR.		
	CO2:	Analyse the performance of single-phase dual, three-phase full-wave bridge converters and dual converter with both resistive and inductive loads.		
	CO3:	Examine the operation of Single-phase AC voltage regulator and Cycloconverter with resistive and inductive loads.		
	CO4:	Differentiate the working and control of Buck converter and Boost converter.		
	CO5:	Differentiate the working & control of Square-wave inverter and PWM inverter.		
14	COURSE CODE:	R2031026	COURSE NAME:	SOFT SKILL COURSE EMPLOYABILITY SKILLS
	CO1:	Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems.		
	CO2:	Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.		
	CO3:	Analyze, summarize and present information in quantitative forms including table, graphs and formulas.		
	CO4:	Understand the core competencies to succeed in professional and personal life		
	CO5:	Learn and demonstrate a set of practical skills such as time management, self-management, handling conflicts, team leadership, etc.		
15	COURSE CODE:	R203102	COURSE NAME:	ADVANCED COMPUTER NETWORKS (Honors Engineering Course)
	CO1:	Implement various networks layers protocols.		
	CO2:	Configure IPv6 protocol.		
	CO3:	Apply the concepts of unicast and multicast routing protocol.		
	CO4:	Configure the transport layers protocols like UDP, TCP, SCTP Services.		
	CO5:	Determine application layer services working with the client server para diagrams like WWW, HTTP, FTP, e-mail, SNMP, DHCP.		
16	COURSE CODE:	R203102	COURSE NAME:	POWER QUALITY (Honors Engineering Course)
	CO1:	Differentiate between different types of power quality problems.		
	CO2:	Explain the sources of voltage sag - voltage swell - interruptions - transients - long duration over voltages and harmonics in a power system.		
	CO3:	Explain the principle of voltage regulation and improvement methods.		
	CO4:	Analyse voltage distortion and current distortion and their indices.		
	CO5:	Know the concepts of distributed generation technologies and power quality monitoring.		


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17	COURSE CODE:	R203102	COURSE NAME:	SPECIAL ELECTRICAL MACHINES (Honors Engineering Course)
	CO1:	Learn merits of PMDC motor		
	CO2:	Choose best control scheme for stepper motor		
	CO3:	Construct the various converter circuits for Switched Reluctance Motors.		
	CO4:	Analyse the characteristics of Brushless dc Motor.		
	CO5:	Understand the operation of Linear Induction Motors.		
18	COURSE CODE:	R203102	COURSE NAME:	ANALYSIS OF LINEAR SYSTEMS (Minors Engineering Course)
	CO1:	Solve problems involving continuous time signals and linear systems.		
	CO2:	Use the Laplace transform to analyse signals, linear circuits and systems.		
	CO3:	Use the Fourier series and transform to analyse signals.		
	CO4:	Solve problems involving discrete time signals and linear systems.		
	CO5:	Illustrate testing of polynomials and network synthesis of LC, RC and RL networks.		
19	COURSE CODE:	R203102	COURSE NAME:	ENERGY AUDITING, CONSERVATION AND MANAGEMENT (Minors Engineering Course)
	CO1:	Understand the principles of energy audit along with various Energy-related terminologies.		
	CO2:	Asses the role of Energy Manager and Energy Management program.		
	CO3:	Design a energy efficient motors and good lighting system.		
	CO4:	Analyse the methods to improve the power factor and identify the energy instruments for various real time applications.		
	CO5:	Evaluate the computational techniques with regard to economic aspects.		



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SE.No	COURSE CODE:	R2032021	COURSE NAME:	MICROPROCESSORS AND MICROCONTROLLERS
1	CO1:	Know the concepts of the Microprocessor capability in general and explore the evaluation of microprocessors.		
	CO2:	Analyse the instruction sets - addressing modes - minimum and maximum modes operations of 8086 Microprocessor.		
	CO3:	Analyse the Microcontroller and interfacing capability.		
	CO4:	Describe the architecture and interfacing of 8051 controller.		
	CO5:	Know the concepts of PIC micro controller and its programming.		
2	COURSE CODE:	R2032022	COURSE NAME:	ELECTRICAL MEASUREMENTS AND INSTRUMENTATION
	CO1:	Know the construction and working of various types of analog instruments.		
	CO2:	Describe the construction and working of wattmeter and power factor meters.		
	CO3:	Know the construction and working various bridges for the measurement resistance - inductance and capacitance.		
	CO4:	Know the operational concepts of various transducers.		
3	COURSE CODE:	R2032023	COURSE NAME:	POWER SYSTEM ANALYSIS
	CO1:	Apply the knowledge of various signals and operations.		
	CO2:	Analyze the spectral characteristics of periodic signals using Fourier Analysis.		
	CO3:	Classify the systems based on their properties and determine the response of LSI system using convolution.		
	CO4:	Understand the process of sampling and the effects of under sampling.		
4	COURSE CODE:	R203202A	COURSE NAME:	SIGNALS AND SYSTEMS (PROFESSIONAL ELECTIVE - II)
	CO1:	Explain the operation and performance of three phase induction motor.		
	CO2:	Analyze the torque-speed relation, performance of induction motor and induction generator.		
	CO3:	Implement the starting of single phase induction motors.		
	CO4:	Develop winding design and predetermine the regulation of synchronous generators.		
5	COURSE CODE:	R203202B	COURSE NAME:	ELECTRIC DRIVES (PROFESSIONAL ELECTIVE - II)
	CO1:	Explain the fundamentals of electric drive and different electric braking methods.		
	CO2:	Analyze the operation of three-phase converter fed dc motors and four quadrant operations of dc motors using dual converters.		
	CO3:	Describe the DC-DC converter fed control of dc motors in various quadrants of operation.		
	CO4:	Know the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters and differentiate the stator side control and rotor side control.		
6	COURSE CODE:	R203202C	COURSE NAME:	ADVANCED CONTROL SYSTEMS (PROFESSIONAL ELECTIVE - II)
	CO1:	Analyze different canonical forms - solution of State equation.		
	CO2:	Design of control system using the pole placement technique is given after introducing the concept of controllability and observability.		
	CO3:	Analyze nonlinear system using describing function technique and phase plane analysis.		
	CO4:	Examine the stability analysis using Lyapunov method.		
CO5:	Illustrate the Minimization of functional using calculus of variation - state and quadratic regulator problems.			


7	COURSE CODE:	R203202D	COURSE NAME:	SWITCHGEAR AND PROTECTION (PROFESSIONAL ELECTIVE - II)
	CO1:	Illustrate the principles of arc interruption for application to high voltage circuit breakers of air - oil - vacuum - SF ₆ gas type.		
	CO2:	Analyse the working principle and operation of different types of electromagnetic protective relays.		
	CO3:	Acquire knowledge of protective schemes for generator and transformers for different fault conditions.		
	CO4:	Classify various types of protective schemes used for feeders and bus bar protection and Types of static relays.		
	CO5:	Analyse the operation of different types of over voltages protective schemes required for insulation co-ordination and types of neutral grounding.		
8	COURSE CODE:	R203202E	COURSE NAME:	BIG DATA ANALYTICS (PROFESSIONAL ELECTIVE - II)
	CO1:	Understand how to leverage the insights from big data analytics.		
	CO2:	Analyse data by utilizing various statistical and data mining approaches.		
	CO3:	Perform analytics on real-time streaming data.		
	CO4:	Understand the various NoSql alternative database models.		
9	COURSE CODE:	R203202F	COURSE NAME:	BATTERY MANAGEMENT SYSTEMS AND CHARGING STATIONS (OPEN ELECTIVE - II)
	CO1:	Describe the construction and operation of different batteries for EV applications.		
	CO2:	Describe charging algorithms of different batteries and balancing methods of battery packs.		
	CO3:	Describe the different kinds of infrastructure needed in the charging stations.		
	CO4:	Describe the requirements of battery management and their maintenance.		
	CO5:	Obtain the modelling of batteries and develop their simulation models.		
10	COURSE CODE:	R203202G	COURSE NAME:	FUNDAMENTALS OF UTILIZATION OF ELECTRICAL ENERGY (OPEN ELECTIVE - II)
	CO1:	Know the concepts of illumination and various illumination methods.		
	CO2:	Know about the resistance - induction and dielectric heating.		
	CO3:	Learn about the resistance and arc welding and welding equipment.		
	CO4:	Know about the mechanisms - equipment and technology used in the electric traction.		
	CO5:	Differentiate the importance of various energy storage systems.		
11	COURSE CODE:	R203202H	COURSE NAME:	INDIAN ELECTRICITY ACT (OPEN ELECTIVE - II)
	CO1:	Learn the national policy and plan and the joint responsibilities of state and central governments.		
	CO2:	Analyse the licensing and the provisions related to transmission and distribution of electricity.		
	CO3:	Remember the composition and powers of Regulatory commissions and CEA.		
	CO4:	Learn the functions of Appellate Tribunal for electricity.		
	CO5:	Know the constitution procedure and provisions in Special courts and dispute resolutions.		
12	COURSE CODE:	R203202I	COURSE NAME:	ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LABORATORY
	CO1:	Know about the phantom loading.		
	CO2:	Learn the calibration process.		
	CO3:	Measure the electrical parameters voltage - current - power - energy and electrical characteristics of resistance - inductance and capacitance.		
	CO4:	Gain the skill knowledge of various bridges and their applications.		
	CO5:	Learn the usage of CT's - PT's for measurement purpose.		
	CO6:	Know the characteristics of transducers.		
	CO7:	Measure the strains - frequency and phase difference.		

13	COURSE CODE:	R2032025	COURSE NAME:	MICRO PROCESSORS AND MICRO CONTROLLERS LAB
	CO1:	Write assembly language program using 8086 microprocessor based on arithmetic + logical + number systems and shift operations.		
	CO2:	Write assembly language programs for numeric operations and array handling problems.		
	CO3:	Write a assembly program on string operations.		
	CO4:	Interface 8086 with I/O and other devices.		
	CO5:	Do parallel and serial communication using 8051 & PIC 18 micro controllers.		
	CO6:	Program microprocessors and microcontrollers for real world applications.		
14	COURSE CODE:	R2032026	COURSE NAME:	POWER SYSTEMS AND SIMULATION LAB
	CO1:	Estimate the sequence impedances of 3-phase Transformer and Alternators		
	CO2:	Evaluate the performance of transmission lines		
	CO3:	Analyse and simulate power flow methods in power systems		
	CO4:	Analyse and simulate the performance of PI controller for load frequency control.		
	CO5:	Analyse and simulate stability studies of power systems		
15	COURSE CODE:	R2032027	COURSE NAME:	SKILL ADVANCED COURSE MACHINE LEARNING WITH PYTHON
	CO1:	Illustrate and comprehend the basics of Machine Learning with Python.		
	CO2:	Demonstrate the algorithms of Supervised Learning and be able to differentiate linear and logistic regressions		
	CO3:	Demonstrate the algorithms of Unsupervised Learning and be able to understand the clustering algorithms		
	CO4:	Evaluate the concepts of limiting pipeline interfaces with examples		
	CO5:	Apply the sentiment analysis for various case studies		
16	COURSE CODE:	R2032028	COURSE NAME:	RESEARCH METHODOLOGY
	CO1:	Understand objectives and characteristics of a research problem		
	CO2:	Analyze research related information and to follow research ethics.		
	CO3:	Understand the types of intellectual property rights.		
	CO4:	Learn about the scope of IPR.		
	CO5:	Understand the new developments in IPR.		
17	COURSE CODE:	R203202	COURSE NAME:	DIGITAL CONTROL SYSTEMS (Honors Engineering Course)
	CO1:	Illustrate advantages of digital systems, sampling and data reconstruction.		
	CO2:	Calculate Z Transform and Inverse Z Transfer function, pulse transfer functions of open and closed loop response.		
	CO3:	Construct various canonical forms and concepts of controllability and observability.		
	CO4:	Compute the absolute and relative stability of discrete time systems using Routh Stability criterion and Root Locus, Design lag and lead compensators to improve system performance using bode diagrams.		
	CO5:	Design of state feedback controllers and state observers.		
18	COURSE CODE:	R203202	COURSE NAME:	ANALYSIS OF POWER ELECTRONIC CONVERTERS (Honors Engineering Course)
	CO1:	Describe and analyze the characteristics of Switching devices		
	CO2:	Demonstrate the operation and perform harmonic analysis of AC-DC power converters.		
	CO3:	Analyze the operation of single-phase and three-phase inverters with PWM control.		
	CO4:	Illustrate the principles of operation of multilevel inverters.		
	CO5:	PWM Control of VSI and diode clamped multilevel inverters.		

	COURSE CODE:	R203202	COURSE NAME:	HVDC TRANSMISSION (Honors Engineering Course)
19	CO1:	Learn the basic concepts of HVDC Transmission & their converters.		
	CO2:	Understand the HVDC System Control Strategies with respect to protection.		
	CO3:	Understand the concepts of HVDC systems protection.		
	CO4:	Understand the various sources of reactive power		
	CO5:	Understand the Multi Terminal HVDC Systems.		
	COURSE CODE:	R203202	COURSE NAME:	EVOLUTIONARY ALGORITHMS (Minors Engineering Course)
20	CO1:	State and formulate the optimization problem, without and with constraints, by using design variables.		
	CO2:	Apply GA and PSO algorithms to solve single objective optimization problems		
	CO3:	Apply HSA and ABC algorithms to solve single objective optimization problems		
	CO4:	Apply Bat and St L algorithms to solve single objective optimization problems		
	CO5:	Formulate multi-objective optimization problem and use NSGA-II to solve two objective optimization problem		
	COURSE CODE:	R203202	COURSE NAME:	FUNDAMENTALS OF POWER ELECTRONICS (Minors Engineering Course)
21	CO1:	Illustrate the static and dynamic characteristics SCR - Power MOSFET and Power IGBT.		
	CO2:	Analyse the operation of phase controlled rectifiers.		
	CO3:	Analyse the operation of Three-phase full-wave converters - AC Voltage Controllers and Cycloconverters		
	CO4:	Examine the operation and design of different types of DC-DC converters.		
	CO5:	Analyse the operation of PWM inverters for voltage control and harmonic mitigation.		


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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING


YEAR:IVth

SEMESTER:1st

Sl.No.	COURSE CODE:	R204102	COURSE NAME:	DIGITAL SIGNAL PROCESSING (PROFESSIONAL ELECTIVE - III)
1	CO1:	Know the concepts of Digital signal processing - frequency domain representation & z transform.		
	CO2:	Compute discrete Fourier transform and fast fourier transforms for different sequences.		
	CO3:	Design IIR filters through analog filter approximation and basic structure of IIR filters.		
	CO4:	Design FIR filters with window techniques and basic structure of FIR filters.		
	CO5:	Learn the concepts of Multirate Signal Processing.		
2	COURSE CODE:	R204102	COURSE NAME:	RENEWABLE AND DISTRIBUTED ENERGY TECHNOLOGIES (PROFESSIONAL ELECTIVE - III)
	CO1:	Illustrate basic concepts of renewable and distributed sources.		
	CO2:	Demonstrate the components of wind energy conversion systems.		
	CO3:	Model PV systems and analyse MPPT Techniques.		
	CO4:	Illustrate the concept of Energy Production from Hydro - Tidal and Geothermal.		
CO5:	Distinguish between standalone and grid connected DG systems and design hybrid renewable energy systems.			
3	COURSE CODE:	R204102	COURSE NAME:	FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS (PROFESSIONAL ELECTIVE - III)
	CO1:	Know the concepts of facts controller and power flow control in transmission line.		
	CO2:	Demonstrate operation and control of voltage source converter and know the concepts current source converter.		
	CO3:	Analyse compensation by using different compensators to improve stability and reduce power oscillations in the transmission lines.		
	CO4:	Know the concepts methods of compensations using series compensators.		
CO5:	Analyse operation of Unified Power Flow Controller (UPFC) and Interline power flow controller (IPFC).			
4	COURSE CODE:	R204102	COURSE NAME:	POWER SYSTEM DEREGULATION (PROFESSIONAL ELECTIVE - III)
	CO1:	Know the essential and operation of deregulated electricity market systems.		
	CO2:	Learn about the different structure model.		
	CO3:	Analyze various types of electricity market operational and control issues using new mathematical models.		
	CO4:	Analyze LMP's wheeling transactions and congestion management.		
CO5:	Analyze impact of ancillary services.			
5	COURSE CODE:	R204102	COURSE NAME:	DATA BASE MANAGEMENT SYSTEMS (Professional Elective - III)
	CO1:	Illustrate the concept of databases, database management systems, database languages, database structures and their work.		
	CO2:	Apply ER modeling and Relational modeling for designing simple databases.		
	CO3:	Summarize the concepts related to relational model and SQL and Write database queries using Apply ER modeling and Relational modeling for designing simple databases.		
	CO4:	Design and develop databases from the real world by applying the concepts of Normalization.		
CO5:	Outline the issues associated with Transaction Management and Recovery, Tree Structured Indexing			

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6	COURSE CODE:	R204102	COURSE NAME:	HYBRID ELECTRIC VEHICLES (PROFESSIONAL ELECTIVE -IV)
	CO1:	Know the concept of electric vehicles and hybrid electric vehicles.		
	CO2:	Familiar with different configuration of hybrid electric vehicles.		
	CO3:	Choose an effective motor for EV and HEV application.		
	CO4:	Understand the power converters used in hybrid electric vehicles.		
	CO5:	Know different batteries and other energy storage systems.		
7	COURSE CODE:	R204102	COURSE NAME:	HIGH VOLTAGE ENGINEERING (PROFESSIONAL ELECTIVE -IV)
	CO1:	Recognise the dielectric properties of gaseous materials used in HV equipment.		
	CO2:	Differentiate the break down phenomenon in liquid and solid dielectric materials.		
	CO3:	Acquaint with the techniques of generation of high AC and DC voltages.		
	CO4:	Acquaint with the techniques of generation of high Impulse voltages and currents.		
	CO5:	Getting the knowledge of measurement of high AC - DC - Impulse voltages and currents.		
8	COURSE CODE:	R204102	COURSE NAME:	PROGRAMMABLE LOGIC CONTROLLERS AND APPLICATIONS (PROFESSIONAL ELECTIVE -IV)
	CO1:	Illustrate I/O modules of PLC systems and ladder diagrams.		
	CO2:	Demonstrate various types registers and programming instructions.		
	CO3:	Examine various types of PLC functions and its applications.		
	CO4:	Assess different data handling functions and its applications.		
	CO5:	Describe the analog operations and PID modules.		
9	COURSE CODE:	R204102	COURSE NAME:	CLOUD COMPUTING WITH AWS (PROFESSIONAL ELECTIVE -IV)
	CO1:	Understand and analyze the architecture of Cloud (Analyze).		
	CO2:	Identify and apply deployment and management options of AWS Cloud Architecture (Apply).		
	CO3:	Design architectures to decouple infrastructure and reduce interdependencies (Create).		
10	COURSE CODE:	R204102	COURSE NAME:	DEEP LEARNING TECHNIQUES (PROFESSIONAL ELECTIVE -IV)
	CO1:	Demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine Learning and Deep Learning.		
	CO2:	Discuss the Neural Network training, various random models.		
	CO3:	Explain the Techniques of Keras, TensorFlow, Theano and CNTK.		
	CO4:	Classify the Concepts of CNN and RNN.		
	CO5:	Implement Interactive Applications of Deep Learning.		
11	COURSE CODE:	R204102	COURSE NAME:	POWER SYSTEM OPERATION AND CONTROL (PROFESSIONAL ELECTIVE -V)
	CO1:	Compute optimal load scheduling of Generators.		
	CO2:	Formulate hydrothermal scheduling and unit commitment problem.		
	CO3:	Analyse effect of Load Frequency Control for single area systems.		
	CO4:	Analyse effect of Load Frequency Control for two area systems.		
	CO5:	Describe the effect of reactive power control for transmission lines.		


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12	COURSE CODE:	R204102	COURSE NAME:	SWITCHED MODE POWER CONVERSION (PROFESSIONAL ELECTIVE -A)
	CO1:	Design and analyse the operation of non-isolated switch mode converters.		
	CO2:	Analyze the operation of isolated switch mode converters.		
	CO3:	Illustrate the operation of resonant converters.		
	CO4:	Analyse the control schemes of converters and design transformer and inductor.		
	CO5:	Model the converters and design controller for closed loop operation.		
13	COURSE CODE:	R2041025	COURSE NAME:	AI APPLICATIONS TO ELECTRICAL ENGINEERING (PROFESSIONAL ELECTIVE -V)
	CO1:	Analyse different models of artificial neuron & Use learning methods of ANN.		
	CO2:	Evaluate different paradigms of ANN.		
	CO3:	Classify between classical and fuzzy sets.		
	CO4:	Illustrate different modules of Fuzzy logic controller.		
	CO5:	Apply Neural Networks and fuzzy logic for real-time applications.		
14	COURSE CODE:	R204102	COURSE NAME:	DATA SCIENCE (PROFESSIONAL ELECTIVE -A)
	CO1:	Acquire the knowledge and expertise to become a proficient data scientist.		
	CO2:	Demonstrate an understanding of statistics and machine learning concepts that are vital for data science		
	CO3:	Explain how data is collected, managed and stored for data science		
	CO4:	Interpret the key concepts in data science, including their real-world applications and the toolkit used by data scientists		
	CO5:	Illustrate data collection and management scripts using MongoDB		
15	COURSE CODE:	R204102	COURSE NAME:	WEB AND STACK TECHNOLOGIES (PROFESSIONAL ELECTIVE -A)
	CO1:	Describe basics of Web Designing using HTML, DHTML, and CSS		
	CO2:	Build real world applications using client side and server side scripting languages		
	CO3:	Design and develop applications using web servers		
	CO4:	Analyze the basics of PHP programming		
	CO5:	Apply Database connectivity with case study for student Information System and Health Management system		
16	COURSE CODE:	R204102	COURSE NAME:	CONCEPTS OF MICROPROCESSORS AND MICROCONTROLLERS (OPEN ELECTIVE -III)
	CO1:	Know the concepts of the Microprocessor capability in general and explore the evaluation of microprocessors.		
	CO2:	Analyse the instruction sets - addressing modes - minimum and maximum modes operations of 8086 Microprocessors.		
	CO3:	Analyse the Microcontroller and interfacing capability.		
	CO4:	Describe the architecture and interfacing of 8051 controller		
	CO5:	Know the concepts of PIC micro controller and its programming.		
17	COURSE CODE:	R204102	COURSE NAME:	FUNDAMENTALS OF ELECTRIC VEHICLES (OPEN ELECTIVE-III)
	CO1:	Illustrate different types of electric vehicles.		
	CO2:	Select suitable power converters for EV applications.		
	CO3:	Design HEV configuration for a specific application.		
	CO4:	Choose an effective method for EV and HEV applications.		
	CO5:	Analyse a battery management system for EV and HEV.		


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18	COURSE CODE:	R204102	COURSE NAME:	CONCEPTS OF INTERNET OF THINGS (OPEN ELECTIVE-III)
	CO1:	Review Internet of Things (IoT).		
	CO2:	Demonstrate various business models relevant to IoT.		
	CO3:	Construct designs for web connectivity		
	CO4:	Organize sources of data acquisition related to IoT, integrate to enterprise systems.		
	CO5:	Describe IoT with Cloud technologies.		
19	COURSE CODE:	R204102	COURSE NAME:	CONCEPTS OF POWER SYSTEM ENGINEERING, (OPEN ELECTIVE-IV)
	CO1:	Know the concepts of power generation by various types of power plants.		
	CO2:	Learn about transmission line concepts and distribution systems schemes.		
	CO3:	Learn about protection equipments and grounding methods of power system.		
	CO4:	Know the economic aspects of electrical energy and their importance.		
	CO5:	Know the importance of power factor improvement and voltage control in power systems.		
20	COURSE CODE:	R204102	COURSE NAME:	CONCEPTS OF SMART GRID TECHNOLOGIES (OPEN ELECTIVE-IV)
	CO1:	Know the concepts of smart grids and analyse the smart grid policies and developments in smart grids.		
	CO2:	Develop concepts of smart grid technologies in hybrid electrical vehicles etc.		
	CO3:	Know the concepts of smart substations - feeder automation - Battery Energy storage systems etc.		
	CO4:	Analyse micro grids and distributed generation systems.		
	CO5:	Analyse the effect of power quality in smart grid and to understand latest developments in ICT for smart grid.		
21	COURSE CODE:	R204102	COURSE NAME:	UNIVERSAL HUMAN VALUES-2: UNDERSTANDING HARMONY
	CO1:	Students will be able to discuss a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence, to explain (or developing clarity) of the harmony in the human being, family, society and nature/existence, to strengthen self-reflection and to judge the commitment and courage to act.		
22	COURSE CODE:	R204102	COURSE NAME:	SKILL ADVANCED COURSE MACHINE LEARNING WITH PYTHON LAB
	CO1:	Implement procedures for the machine learning algorithms		
	CO2:	Design and Develop Python programs for various Learning algorithms		
	CO3:	Apply appropriate data sets to the Machine Learning algorithms		
	CO4:	Develop Machine Learning algorithms to solve real world problems		
23	COURSE CODE:	R204102	COURSE NAME:	EHV AC TRANSMISSION (Honors Engineering Course)
	CO1:	Calculate the transmission line parameters.		
	CO2:	Calculate the field effects on EHV and UHV AC lines.		
	CO3:	Determine the corona, RI and audible noise in EHV and UHV lines.		
	CO4:	Analyze voltage control and compensation problems in EHV and UHV transmission systems.		
	CO5:	Understand reactive power compensation using SVC and TCR		
24	COURSE CODE:	R204102	COURSE NAME:	SMART GRID TECHNOLOGIES (Honors Engineering Course)
	CO1:	Know the concept of smart grid and analyse the smart grid policies and developments in smart grids.		
	CO2:	Develop concepts of smart grid technologies in hybrid electrical vehicles etc.		
	CO3:	Know the concepts of smart substations - feeder automation - Battery Energy storage systems etc.		
	CO4:	Analyse micro grids and distributed generation systems		
	CO5:	Analyse the effect of power quality in smart grid and to understand latest developments in smart grid technology		


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25	COURSE CODE:	R204102	COURSE NAME:	POWER ELECTRONIC CONTROL OF ELECTRIC DRIVES (Honors Engineering Course)
	CO1:	Understand the concepts of vector control methods for Induction Motor drive systems.		
	CO2:	Understand the principle of sensor less control of Induction Motor drive.		
	CO3:	Understand the principle of DTC of Induction Motor drive.		
	CO4:	Learn the modeling & control aspects of PMSM and BLDC Motor drives.		
	CO5:	Understand the construction operation and control aspects of SRM.		
26	COURSE CODE:	R204102	COURSE NAME:	NEURAL NETWORKS AND FUZZY LOGIC (Minors Engineering Course)
	CO1:	Analyse different models of artificial neuron.		
	CO2:	Illustrate training and classification using perceptron algorithms.		
	CO3:	Evaluate different paradigms of ANN.		
	CO4:	Classify between classical and fuzzy sets.		
	CO5:	Analyse various modules of Fuzzy logic controller.		
27	COURSE CODE:	R204102	COURSE NAME:	CONCEPTS OF ELECTRIC DRIVES AND ITS APPLICATIONS (Minors Engineering Course)
	CO1:	Explain the fundamentals of electric drive and different electric braking methods.		
	CO2:	Analyze the operation of Three-phase converter fed dc motors and four quadrant operations of dc motors using dual converters.		
	CO3:	Describe the DC-DC converter control of dc motors in various quadrants of operation.		
	CO4:	Understand the concept of speed control of induction motor by using AC voltage controllers, voltage source inverters and rotor side control.		
	CO5:	Understand the speed control mechanism of synchronous motors.		


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